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Preface

Health, healing, education, political representation, sustainable development, and resource management are some of the critical issues facing northerners and Aboriginal peoples today. Land claims, self-determination, and an increased voice in international circumpolar organization are key factors influencing choices made by government and non-government organizations in the Aboriginal and non-Aboriginal sectors. Contributions to this publication present a variety of points-of-view on these issues. Valuable perspectives provided by Aboriginal peoples in their own words, contribute to the growing body of academic literature on traditional knowledge. At a time when Canada is evaluating foreign policy with regard to circumpolar affairs, issues such as those presented in this volume take on an international dimension.

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I. HEALTH AND HEALING

Urban Aboriginal Mothers' and Daughters' Expressed Concerns about Weight: An Interview Study

Gail Marchessault[1]

Educational approaches to the prevention and management of common chronic health problems such as diabetes often include or even emphasize weight control (Canadian Diabetes Association 1989, Health and Welfare Canada 1988a, Szathmary 1987, West 1978). Studies have documented higher weight norms for people in many First Nations communities (Harrison and Ritenbaugh 1992, Young and Svenhuysen 1989). While there is some discussion of Aboriginal peoples' perceptions of the role of weight in diabetes (Garro 1995, 1996; Joe 1993, Lang 1989), there is little in-depth analysis regarding how Aboriginal people themselves perceive weight issues more generally. It has been reported that some Indian people prefer heaviness as a sign of health and as the ideal of attractiveness (Garro and Lang 1993, Hickey and Carter 1993). Reports such as these seem to be based on studies with middle-aged and older participants. Recent surveys of young Native American women reported high usage of potentially hazardous weight control methods (Rosen *et al.* 1988, Smith and Krejci 1991, Snow and Harris 1989, Story *et al.* 1995, Story *et al.* 1994). Such studies have not yet been conducted in Canada. These results are similar to the findings of studies with middle-class Canadian women and girls (Dairy Bureau of Canada 1993, Health and Welfare Canada 1988b).

Another gap in the literature relates to the frequently assumed but largely unexamined influence of mothers' concerns about weight on their daughters' perceptions of weight issues (Brigman 1994, Parker *et al.* 1995, Rabinor 1994). This assumption has ramifications for educational approaches and should be examined. The few investigations comparing attitudes of non-clinical samples of mothers and daughters report

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variable findings (Rozin and Fallon 1988, Hill *et al.* 1990, Thelen and Cormier 1995). The objective of this paper is to explore urban Aboriginal Canadian mothers' and daughters' stated concerns about weight.

Methods

Interviews with urban Aboriginal women were part of a larger study to learn how a primarily low-income sample of middle-aged non-Aboriginal and Aboriginal women and their teenaged daughters talk about weight (Marchessault 1993). A random sample was drawn from a class list of grade eight girls in a core-area school in Winnipeg and extrapolated to include the mothers. Exclusions were made when mothers spoke limited English, or the daughter was not living with her mother, leaving 25 mother-daughter pairs eligible for the study. The final sample size was 20 pairs, a response rate of 80%, 5 pairs were unavailable. One unrelated woman and girl were also interviewed, for a total of 42 interviews. The interviews occurred between October 1992 and March 1993 — most took place in the participants' homes; all but one were tape-recorded and fully transcribed.

Data from only the Aboriginal participants are analysed in this paper, with some comparisons made to the non-Aboriginal sample. Nine of the 20 women identified themselves as Métis, Native, Aboriginal, Cree, or Saulteau; eight of their daughters were interviewed (one of the daughters moved before she could be interviewed). Eight of the women spoke Cree (4) or Saulteau (4) as their first language, and the ninth said she was "half-Saulteau". One girl reported being fluent in a Native language. Most of the families had lived in Winnipeg for more than 10 years.

The educational backgrounds of the mothers were diverse. Two had attended university or college, six had completed between grade 8 and 11, and one mother grew up on the trapline and never attended school. The annual household incomes of the seven women who reported it were all below the low income level for 1991, the most widely used measure of poverty in Canada (Economic Council of Canada 1992, Statistics Canada 1993). The average age of the mothers was 40, ranging from 32 to 54 years old. Most of the daughters were 14 years old.

The format was an in-depth, semi-structured interview. Early in the interview each participant was asked if she was happy with the way she looked, what she would change if she could, and if she thought weight was a problem for girls, or women. Later participants were asked how being overweight would affect a girl's life and if she was ever afraid of getting fat. Identical questions were asked as they related to being underweight. Close-ended questions and the *Eating Attitude Test* — a 40-item, six-point Likert scale originally developed as a screening tool for eating disorders (Garner and Garfinkel 1979) — was used to describe concern about weight in nonclinical samples (Smead and Richert 1990).

Most of the mothers and daughters expressed concern about being overweight; a case study from this group will be described. Brief comments from two other mother-daughter pairs and some aggregate responses from all 17 interviews will be presented to illustrate the variability in peoples' responses. Some participants expressed minimal concern about weight issues (one woman and three girls). Others expressed extreme concern (one woman and one girl). There was a lack of consistency regarding expressed concern about weight within the mother and daughter pairs.

Results

Gloria and Gwennie — The first mother-daughter pair is Gloria and Gwennie. Gwennie, the daughter, described herself as athletic, enjoying volleyball, football, and sometimes hockey. She said she was "all caught up in school" and doing well. Gwennie seemed shy, speaking too softly to be heard at times. When asked if she was happy with the way she looked, she said "sometimes". She seemed uncomfortable talking about her current weight, so I avoided asking direct questions about it. When asked if weight was a problem for girls generally, however, she brought up her own experience: "Sometimes. It was for me for awhile." She said that she used to weigh about 165 pounds, and worried that "it was gonna keep going higher and higher, but then it went lower instead." When asked how her weight might change as she got older, she simply said "Maybe I'll lose, 'cause I'm trying hard to", and she thought this would probably make her "feel better".

Gwennie reported her current height and weight as 5'5" or 5'6" and 150 pounds, with a desired weight of about 125 pounds. When asked, she said she was afraid of getting fat because she might get sick. She was also afraid of getting too thin because she would look "too different".

Gwennie laughed when asked if she ever gave her mother advice about her weight, and said "no". She said her mother's advice was: "Well, she tells me, it's good I'm staying away from junk food and she thinks I'm overdoing it, drinking milk and that, makes my bones get big."

Gwennie seemed concerned about her weight but did not report any extreme efforts to lose. She responded to my question about dieting with: "No I don't diet. I just watch", explaining she avoided greasy foods, "and I don't really eat things with a lot of sugar in them. Cookies or cake or something like that... I don't really like eating junk that much." However, she reported losing 10 pounds in a week from exercising and not eating junk, and asserted "I control it now." Given her reported weight loss, and other comments about getting sick of eating and from eating certain foods, Gwennie may have been more than moderately concerned about her weight. Her reported efforts to lose, and her weight concerns seemed to be part of a broader, generally positive self-evaluation.

Gwennie was the oldest of four children. Her mother, Gloria, was 33 years old at the time of the interview. She had lived in Winnipeg for three years. This Métis woman grew up in a small northern community where her father was the mayor. Gloria could speak both Cree and Saulteau.

Weight was an issue for Gloria. She and her husband had made New Year's resolutions to lose weight. When asked, she said: "I'm happy about the way I look, but my weight...it sort of bothers me. ...I can't lose weight. And I'd like to." Gloria, like many of the women I spoke with, felt her weight problems had begun with her pregnancies. She reported gaining about 60 pounds with each pregnancy, especially difficult to lose after the last two births.

Gloria said she had tried diet pills without success. She reported more success with Weight Watchers and exercise, losing about 40 pounds in three months. However, she couldn't afford to continue going and regained the weight when she stopped.

Gloria classified herself as "markedly overweight" at 5'8" and 230-240 pounds. She wanted to weigh 200 pounds. She said she dieted occasionally, meaning she picked out "the right foods" such as light bread and Weight Watchers' margarine, boiled every-

thing, drank lots of water, and exercised regularly. She added that she rides an exercise bike and does light aerobics.

She said that weight was a fairly minor issue for her. Her concerns were health-related. She said she felt out of breath. "And I figure...I'd feel better, healthier, if I was...an average weight." She was not afraid of getting too thin, because "it would never happen." She said she advises her daughters that "it's important for them to be in shape, for their health." Generally speaking, though, she said she didn't give advice. When asked if having a teenage daughter affected how she felt about weight, she replied, "Sort of, because ... they'd like me to look good." She reported that her children ask her, "How come you're fat?" and speculated "...maybe they're concerned about my health. That's why they tell me to lose weight sometimes."

Early in the interview, when asked what might influence the way women feel about their weight, Gloria responded:

> "I guess they don't want to lose their men...that would probably be one issue. And, for their health problems. For me, it would be health because some are afraid their men [will] go astray, but I don't worry about that."

Interestingly, this came up again later. She noted that weight had been more of an issue immediately after she first gained it:

> "At the time I figured, '...if I don't lose weight, then my husband might feel different about me'. But then he reassured me that he didn't feel different...he said no matter how I looked he still loved me and he wasn't interested in other women."

Near the end of the interview, when asked if people could control their weight, Gloria responded:

> "Well, some don't really care how they look...I care but I just can't. I just can't do it."

Both Gwennie and Gloria expressed some concerns about their weight and seemingly moderate efforts to control it.

Jackie and Joan — Gwennie's classmate Jackie expressed extremely critical evaluative comments about her own weight. Jackie remarked that she had been chubby ever since she was six years old. She said she was embarrassed to go swimming. She rated herself as "very unhappy" with the way she looked and classified herself as "markedly overweight". Weight came up immediately in her interview. Given an opportunity to change her looks, weight was the first and only thing she'd change. Specifically, she would change her waist, hips, thighs, and "the flap underneath my arms". Jackie was one of the few girls in this study to say she dieted often. She spoke extensively about her efforts to lose weight, summing up with: "I'm not starving myself anymore. My mom says I am, but I don't think so." She talked about exercise. She wondered why her weight sometimes went up even though she hadn't eaten anything, indicative of frequent weigh-ins. She even weighed her dogs. Jackie seemed aware that her concern might be a problem, but clearly stated her priorities: "I know it's ...bad for my health, but everybody else seems skinnier than me."

Jackie dismissed a friend's compliment on her appearance, and talked favourably of two teachers who were helping her lose weight. She made numerous comments indicating she could not like herself unless she was slim. For example, she ended the interview saying: "I feel...unwanted when I'm fatter than everybody else. I wish I would be skinnier, that would be my only wish, if somebody granted me a wish."

Despite the self-portrait Jackie's words painted, her weight was not out of line with that of her classmates. The nurse reported her height and weight at 5'6" and 123 pounds.

Jackie's mother, Joan, classified herself as slightly overweight at 5'3 1/4" and 130-135 pounds, but said she was "somewhat happy" with her weight and wouldn't change anything about her appearance. She noted a tendency to gain weight around Christmas, but said her weight usually went back to normal within a month, from exercising, eating properly, and avoiding junk food. Joan was a vegetarian. Her concerns centred on health. She said she didn't diet. When asked what advice she gave her daughter, she replied:

> "In my eyes, my daughter is perfect the way she is. I wouldn't change anything about her, but...she doesn't seem to be happy with herself."

Joan seemed most distressed about Jackie's eating habits and excessive concern about weight. Joan's expressed concern about her own weight seemed fairly moderate. She did not seem to be role modelling excessive concern about her own weight.

Nikki and Nora — In the next example the mother, Nora, expressed more interest in weight than her daughter, Nikki. Nikki's answer to my opening question on appearance was: "I never really thought about the way I looked. The way I am is the way I am." She answered my closing question by saying she never talked about weight with her friends because it was "too boring". When asked if she thought weight affected girls and boys differently, her response was: "No. We're all people. Does it matter?" When asked if being overweight would affect a girl in her everyday life, she responded: "I don't see how it could." Although Nikki classified herself as overweight, she consistently expressed a lack of interest in weight issues.

Her mother, by contrast volunteered her ideas immediately. She classified herself as "horribly overweight" at 5'6" and 176-178 pounds. She described herself as "always a fat chubby little girl", from the age of six. When asked if her weight had ever affected her life, she spoke harshly:

> "When I was a fat slob, at almost 300 pounds, 200 pounds. Of course. Because, I remember when I was 200 pounds, I could barely walk. And I remember some guys were walking behind me. They were making snide remarks. And...nobody wants to see a fat person."

She stated that she did not like television star Roseanne because she was fat. However, she wanted to warn people against dieting:

> "I used to think at one time, 'Oh, I am so fat. All I'll do is just drink my tea...and smoke.' I made a stupid remark one time. I said, 'Smoke is my meal. That's all I need is a cigarette, and coffee'."

Nora said this attitude had contributed to a serious problem with anemia.

These comments have been selected from a lengthy interview to demonstrate the expression of interest in weight. Nora was knowledgeable about weight, and also expressed an empathetic understanding of how difficult it was to lose weight.

Group Responses — Looking at the sample collectively, all eight Native girls either classified themselves as overweight (4), or indicated that they wanted to lose weight (4). Eight of the nine mothers said both that they were overweight and wanted to lose weight. Five of these said they were markedly overweight. The one woman who said she was slightly underweight stated she had formerly been overweight. Fewer of the non-Native sample (7 of 12 girls, 7 of 13 women) said they were overweight or wanted to lose weight. Five of the non-Native girls saw themselves as too thin, in stark contrast to the Native girls' perceptions of themselves as too heavy.

The participants' weight status provides a context for their weight concerns. Self-reported weights have been found to be valid and reliable for girls and women (Stewart 1982, Stunkard and Albaum 1981). However, the girls in this study were uncertain of their height and weight. According to the body mass index (BMI), all five of the Native girls who provided approximations had a weight status consistent with a healthy weight. BMIs for six (67%) of the Native mothers had an over-weight status, indicating a potential health risk. For the 11 non-Native girls who provided their height and weight, seven (64%) had a low BMI, consistent with their self-evaluations of thinness. Five (42%) of the non-Native mothers had BMIs in the range indicative of potential health risk due to overweight.

The results of the *Eating Attitude Test* (EAT) are reported in Table 1. Higher scores on the EAT indicate more concern about weight. Native mothers' scores were higher than both their daughters' and the non-Native women's, but this was only statistically significant for the women. Median scores for the Native and non-Native girls were similar. There were scores above the cut-off for risk for an eating disorder in all groups. These results are consistent with the interview data.

Discussion and Implications

While it is difficult to generalize from such a small sample, the majority of the urban Native mothers and daughters interviewed for this study were concerned about being overweight. The expressed concerns were comparable in many ways to those expressed by the non-Native participants. Because most of the participants shared mainstream Canadian ideas about weight, it was difficult to discern if mothers influenced their daughters. The number of discrepant interviews is small, but there was no congruent pattern in weight concerns within pairs in either the Native or the non-Native families. (For example, there was no family where both mother and daughter were extremely concerned about their weight). This suggests that weight concerns are not necessarily passed directly from mother to daughter.

Reports of a high prevalence of chronic diseases, especially diabetes, among many groups of Aboriginal people (Joe and Young 1993, Young 1993, Young *et al.* 1985) have led to recommendations for prevention programs, some specifically directed to young people (Delisle *et al.* 1995, Macaulay *et al.* 1996, Perez 1995, Wilson *et al.* 1993). Our data suggests that health professionals working with teenaged girls should be sensitive to weight preoccupation. Bulimia has been reported in people with diabetes (Krenz *et al.* 1993), and concerns about weight in middle-class girls have been

Table 1. Eating Attitude Test Scores of Native and Non-Native Mothers and Daughters

	n	Mean EAT	Median EAT	Number of At-risk Scores
Native				
Mothers*	9	21.4	24	3
Daughters	8	20.3	14	1
Non-Native				
Mothers*	12	11.3	8	1
Daughters	13	14.2	14	1

Note. The higher the score, the greater the concern about weight. The maximum score was 117. (A question on menstruation was not scored.)
*Starred pair is significantly different, ($U = 24.5$; $p < 0.05$, Mann-Whitney U test).

documented as early as grade four (Feldman *et al.* 1988). A large survey of Manitoba students found comparable risk of eating disorders at all income levels (Leichner *et al.* 1986). This study suggests that urban Native women and girls are also susceptible to weight concerns.

The literature suggests perceptions may vary within a Native community (Garro 1995, Joe 1993, Lang 1989). Further investigations should explore concern about weight including cultural settings, age, gender, degree of isolation and the prevalence of factors influencing diabetes. The degree of diversity existing in peoples' interpretation of weight messages also requires additional research.

The issue of weight perception in Aboriginal people requires additional research. Yet, perceptions of weight issues are inextricably linked with eating, activity, and other matters of importance to the management of diabetes and other chronic diseases. These preliminary data suggest future study in this area is warranted so that educational programs can be based on a fuller understanding of the meaning of weight in peoples' lives.

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Cultural Rationality and Environmental Health Risk Perception in Northern Canada

John O'Neil[1], Brenda Elias[2], Christopher Fletcher[3], and Annalee Yassi[4]

This paper describes the results of a study on the cultural perceptions of health risks related to environmental changes associated with industrial development in two Aboriginal communities. Our interest in conducting this study was stimulated by a growing recognition of the importance of incorporating the knowledge and perspective of local populations into development decisions. Further, it is increasingly recognized that community level perceptions of health risk vary between cultures and reflect specific lifestyles and histories. These too should be considered in development initiatives.

This study is part of a multi-site project investigating a variety of influences on health risk perception in Canadian Aboriginal communities facing large scale development initiatives. The data are placed in a political, economic, and historical framework underlining the cultural rationality of health risk perceptions. A number of environmental health issues in northern and Aboriginal communities are addressed. These include:

- incorporating community understandings of health into environmental impact assessment (EIA) of development projects;
- fostering empowerment of Aboriginal communities to effect change in development policies which impact on their communities;
- finding new techniques for disseminating scientific findings in remote communities where linguistic and cultural differences limit the effectiveness of established forms of risk communication by scientific investigators;

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- understanding how culture influences the ways that community level comprehension of risk are shaped, both in daily activities and with respect to the impacts of development.

Our research draws from a theoretical literature which suggests that public perceptions of risk, while different in many cases from scientific determinations, are both valid and critical to protecting people from environmental illness (Johnson and Covello 1987) and that social and cultural dimensions of risk are understandable within a framework of cultural rationality (Douglas and Wildavsky 1983). Further, the incorporation of human health impacts from development has been a neglected component of the EIA process in Northern communities (CEARC 1989). This oversight is now being addressed by this and other research on human health impacts from development.

Methodology

This paper reports on research conducted in two Aboriginal communities located in different regions of Canada. The first case study occurred in Wollaston Lake, a Dene community located in northeastern Saskatchewan. Over the years, this community has directly and indirectly experienced the impacts of uranium mining. It has also participated in a number of joint Federal-Provincial environmental impact assessments concerning several proposed uranium mining projects. The second case study occurred in Kuujjuarapik, an Inuit community located on the Eastern shore of Hudson Bay in Northern Quebec. This community was taking part in a joint Federal-Provincial environmental impact assessment of the Hydro Quebec Great Whale Hydroelectric Project.

Our methods included open-ended interviews, participant observation, a community survey, a literature review, and published interviews (Ecologistics Limited 1992, Roy and Fletcher 1992). Both community governments were informed of the objectives and methods of this study. On arrival in the community, the respective Chief and Mayor and other council members were consulted to confirm community acceptance of the study.

Prior to conducting the community survey, the questions were reviewed and corrected for cultural appropriateness. The survey was translated from English into Dene and Inuktitut, and then translated back into English by a second interpreter to identify possible misinterpretations. Questions were revised based on this process. The final version covered contemporary cultural patterns (i.e., land use activities and country food consumption) and the following environmental health risk areas: 1) land use activities, 2) everyday living activities, 3) medical treatments/procedures, 4) global environmental impacts, and 5) uranium mining and hydroelectric development dangers.

A sample demographic framework was then established. In Wollaston Lake, a sample of 105 people were interviewed, of which 63% were randomly selected and 37% were enrolled opportunistically. When compared across age, gender, and educational lines, there were no significant differences between the random and the opportunistic group. Of the 105 community people who responded to the survey, 51.4% were women and 48.6% were men. A very large majority of this group (73.3%) were between the ages of 18 and 39 years; 26.7% were 40 years or older. The survey was administered to 74 adults in Kuujjuarapik. Respondents were identified by a "snowball" approach and efforts were made to have the sample representative of the age structure of the community; 62% of respondents were between the ages of 18 and 39 years, 38% were 40 years or older. Thirty eight respondents were women and 36 were men. The sample

size represents approximately one third of the available adult population of Kuujjuarapik at the time of the study.

Cultural Perceptions of Environmental Health Risks

Risk perceptions are compared across two domains of environmental threats. The first domain describes cultural perceptions of risks associated with traditional land use activities. The second domain describes perceptions of risks associated with industrial developments in the respective regions. Similarities and differences in Dene and Inuit cultural perceptions of risk are described, and then compared to more specific concerns related to industrial development.

Traditional Land Use Risks

In Wollaston Lake, traditional land use activities (hunting, trapping, and fishing) continue (O'Neil *et al.* 1996). Dangers associated with such activities are a part of everyday life and the collective memory of the community, especially that of the older generation. In Table 1, a distinct pattern of risk perception associated with a long history of traditional land use (subsistence and commercial) activities is quite apparent. The overall pattern and its direction illustrate that the Denesuline are confident in their assessment of danger, which is evident in the low proportion of "uncertain" responses.[5]

A considerable number of respondents (67.7%) perceived fall boat travel as the most dangerous, which is consistent with their knowledge of how unpredictable the weather can be, of boats icing up, and of the instability of the lake during this time. This perception is best illustrated by the following field note documenting one elder's comment on how this knowledge is used to off-set the risks they take to continue a traditional life style:

> "By 10 in the evening the winds died down and the lake was relatively calm. [After waiting out the storm on an island], they left, and it didn't take long to get to the cabin. He stated that this time of year makes it dangerous to travel [so they have to be careful]. But travel they must even though the boats ice up so quickly and the lake can become too rough to travel."

How such knowledge is used to mitigate the dangers of other land use activities was also evident in other domains. While most respondents (54.2%) perceived hunting alone in the winter as not dangerous, a large minority did regard it as dangerous. This split in perception should not be construed as unusual. One respondent captured this ambivalence in his comment that "it's fun providing you know what you are doing". Hunting alone in the winter can be dangerous, if no one else knows where you are, if you are unfamiliar with a particular area, or if you are not prepared with food and temporary shelter to wait out a storm. Similarly, a substantial number of respondents (68.7%) agreed that trapping away from the community is not dangerous. Experienced trappers noted, however, that although it is not typically dangerous, it can be. They cautioned that when working a new trap line, the ice could be too thin in some areas of your line, especially around rapids or due to underground springs.

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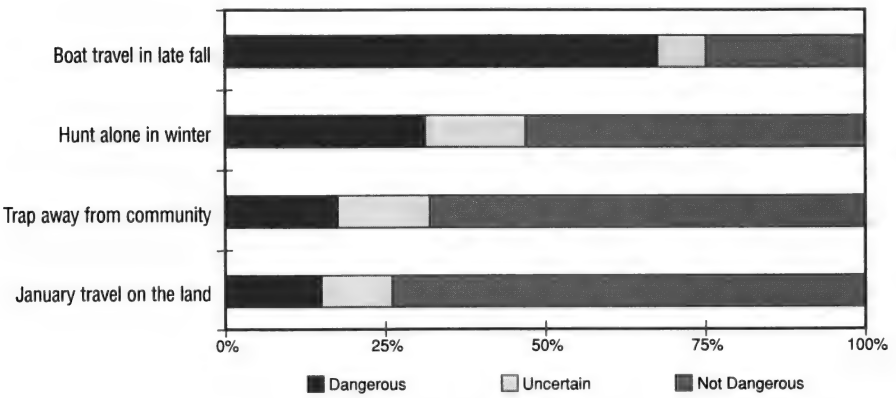
5. The term "uncertain" is used to designate the Don't know / No opinion response category on the survey.

Table 1. *Perceptions of Land Use Dangers in Wollaston Lake (n=96)*



Finally, we inquired into travelling on the land in January and found that a large number of respondents (85.5%) considered this activity as not dangerous. Travelling at this time of year is something community members look forward to. Snowmobiles provide a more efficient and cheaper means of travelling to other communities. Many respondents visited other Dene communities more in the winter than in the summer because of greater accessibility. Nonetheless, some respondents cautioned that snowmobiles can break down at any time and that many people can be unfamiliar with landmarks and direction.

The levels of uncertainty (ranging from 7.3% - 14.6%) expressed by respondents for these activities can be interpreted in several ways. Risk perceptions are strongly contextual for the Denesuline, contingent on broader environmental conditions that affect the "risk" of an activity. Uncertainty, in other words, may reflect a cultural rationality which recognizes that risk is best contained by remaining noncommittal and open to contingencies and conditions that may affect the safety of a given activity. Uncertainty then may be interpreted positively, as an indication of wisdom and respect for the land, and not as an indication of ignorance or lack of knowledge.

In Kuujjuarapik, decisions on when and where to hunt are contingent on a number of criteria. External factors such as weather conditions, migratory movement of animals and seasonal availability will play significant roles in the itinerary of hunters. Social factors like the availability of hunting partners, the condition and accessibility of equipment, the amount of time the individual has to hunt, and the shared knowledge about game location will also influence decisions concerning land use activities. According to several respondents, experience is perhaps the most important factor used to evaluate risk in land use activities. An experienced hunter will hunt during any season provided the conditions are adequate, and will have little difficulty facing extremes in temperature or breakdowns in equipment. On the other hand, families generally spend time on the land at a semi-permanent camp in the spring and summer when the climate is more forgiving. In the winter, extended hunting trips are generally undertaken by the most experienced hunters, day trips for fishing and caribou hunting are made by less experienced hunters and families in good weather conditions. Risks associated with

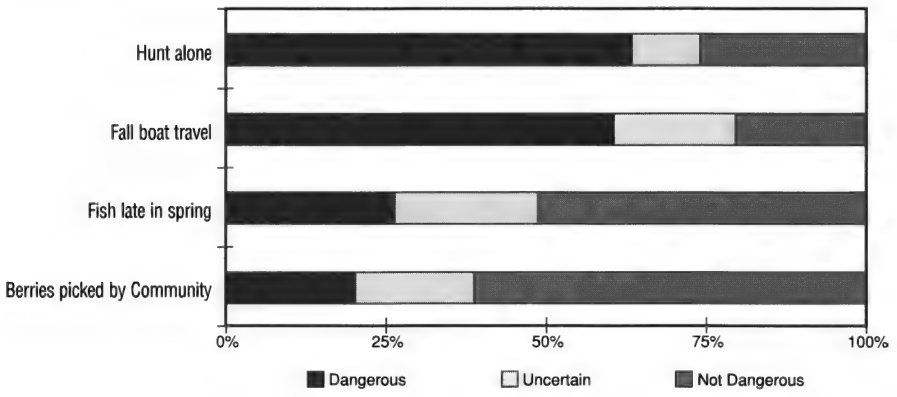
land use activities are influenced by both individual experience, season, and the type of activity.

The accumulated experience of many generations of land use by people in the region is reflected in Table 2. Hunting alone was considered a dangerous activity by 62% of those surveyed and only 11% were uncertain about it. The answers concerning the risk of fall boat travel were quite similar, with a slightly larger portion uncertain. These questions assess strongly promoted norms of land use practice within the community which explicitly underline the danger of hunting alone, something which is rarely done. Several respondents stressed the importance of not hunting alone and said that they had never done so. Similarly, fall boat travel was described as risky because of falling temperatures and less predictable weather. People who responded that hunting alone or fall boating were not dangerous qualified their response by describing specific conditions, locations, or routes where other hunters met regularly. In these cases, the "not dangerous" responses to hunting alone were effectively linking danger with the predictive capacity of meeting others, which comes with experience.

When asked about the perception of land-use danger, clarification was often required. For example, some people found it difficult to abstract a generalized "spring". They asked questions like, "When in the spring?", "Where?", and "What's the weather like?". We added the qualifier "when the ice is starting to go" to give an environmental context and to examine responses to a potentially dangerous situation, regardless of individual experience and ability. Others responded that everything "depends" on one's knowledge base, age, number of travelling companions, preparedness, and other factors.

Even the risks associated with berry picking near the community required contextualization. While 62.5% of people said that it was not a dangerous activity, others cited cases where seemingly innocuous activities had turned dangerous because the people involved did not anticipate a change in the weather, or because equipment failed. Additionally, some people felt the consumption of berries taken near the community presented some risk, as they were exposed to dust from the roads and contaminated by garbage from the dump or sewage from the lagoon.

Table 2. *Perception of Land Use Dangers in Kuujjuarapik (n=72)*



The pattern of responses to the land-use danger questions suggest two things: first, that it is difficult to offer a universal assessment of risk for a given situation when numerous factors must be taken into consideration; and second, that context is critical in making judgments about danger, which points to the importance of individual experience in the social construction of risk.

Risk Perceptions of the Impact of Development on Land-use Activities

Such contextuality is evident in other domains, where we examine responses to statements made in the region concerning specific health risks associated with uranium mining. In Table 3, there is considerable variation in the extent to which people agree with statements made about the impacts of uranium mining on land-use activities.

Agreement, for instance, is strongest for statements that suggest that the physical presence of the mine may have a direct impact on the health or behavior of animals. However, there was less concern that people who consume plants and animals from the mining region will get sick. This finding suggests that while most people are concerned about the direct effects of uranium mining on the local ecology, they are less concerned that their own health may be affected by their continued consumption of plants and animals affected by mining activities. Our ethnographic work suggests that many people have a high level of confidence in their ability to recognize diseased or otherwise affected plants and animals. Traditionally, Denesuline hunters avoid taking animals that appeared "abnormal," and likely continue to use similar empirical criteria in order to distinguish potentially "dangerous" animals, that, if consumed, might make them sick.

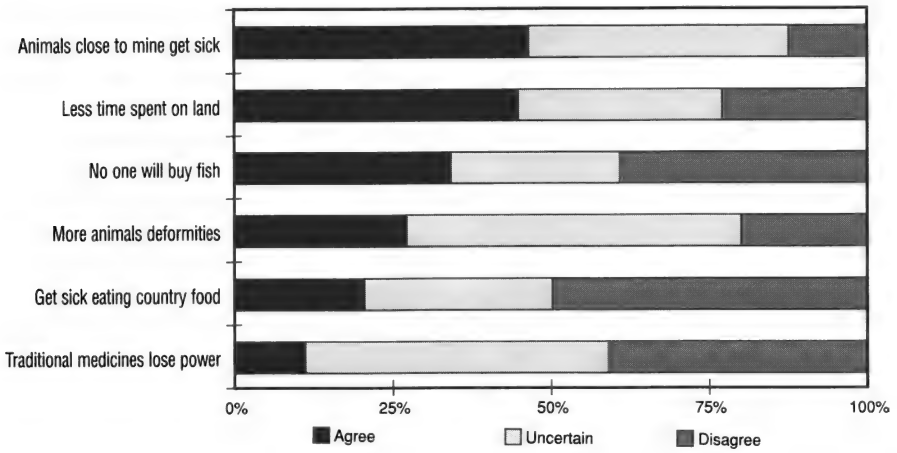
Uncertainty remains relatively constant in the 25 to 35% range, and likely reflects the underlying cultural rationality of risk perception. Since Denesuline knowledge of animal behavior and well-being is rich and detailed, many respondents are unwilling to commit themselves to a statement that does not include the myriad of contingencies and contextual factors that account for changes in the behavior or health of an animal population.

Contextual factors, for instance, may include perceptions of activities that are associated with the presence of the mining industry, but not necessarily directly connected to uranium and the risks of radiation. For example, the perception of fewer people spending time on the land is strongly associated with stories of "bad white men". The stories describe the killing of Dene men by "bad white men", the stealing of their food, the abduction of their children, and the destruction of their camps. During a recent EIA hearing, the Chief of the community cautioned the mining companies and Panel Members that the belief in "bad white people" still exists and generates fear in the Athabasca:

> "... it's more or less that they have the safety of living [here] instead of living out there again. So it has created also a psychological disturbance for the trappers, hunters, [and] fishermen." (Joint Federal-Provincial Panel on Uranium Mining Transcript 1993: 5)

There are also many reasons why fish are not purchased. The decline in fishing, for example, has been strongly tied to economic factors (i.e., increased fishing and transportation costs). Some people are concerned with the perceived marketable quality

Table 3. *Agreement Concerning Development Impacts on Land Use in Wollaston Lake (n=96)*



of their fish, not only now but in the future, as mining activity increases. On the other hand, most people (50%) believe they would not get sick from eating country food; 30% were uncertain. This uncertainty was evident for other country foods, and increased for mining impacts on traditional medicines. Overall, it appears that there is a pattern of similarly shared perceptions, which illustrates that members of this community continue to have confidence in their ability to detect change, yet they remain sensitive to the uncertainty of environmental risks.

When the perception of risk in land use activities is compared with those associated with the establishment of a hydroelectric dam and reservoir, a strikingly different pattern emerges. Nearly everyone in Kuujjuarapik has some knowledge of the mercury issue. It is pervasive in community level discussions about the impacts of the La Grande Project which is understood to be analogous to what can be expected in the case of the Great Whale project; an expectation shared by Hydro Quebec (1993). Discussions about the effects of mercury are also persistent in the various media. The mercury discourse is the principal factor in the association of danger with the Great Whale project. Eating fish caught near a dam was dangerous to more than 80% of respondents. Similar response rates were given to questions on both hunting and berry picking near the dam.

In the case of trapping near the dam we see a different response entirely with more than 65% of respondents uncertain. This likely reflects two co-related factors. The first is that fur bearing mammals that are trapped are not normally eaten (Inuit hunters trap mainly fox) and hence the vector for risk to the individual consumption of contaminated meat is avoided. It is also likely that some proportion of the "uncertain" segment is reflecting a "no experience" category. Relatively few people in Kuujjuarapik have a lot of experience with trapping, and virtually none have experience trapping near hydro dams.

Table 5 presents results of research into perceptions that animal populations become unhealthy or are disrupted as a result of Hydro dam development. Only 89% of the

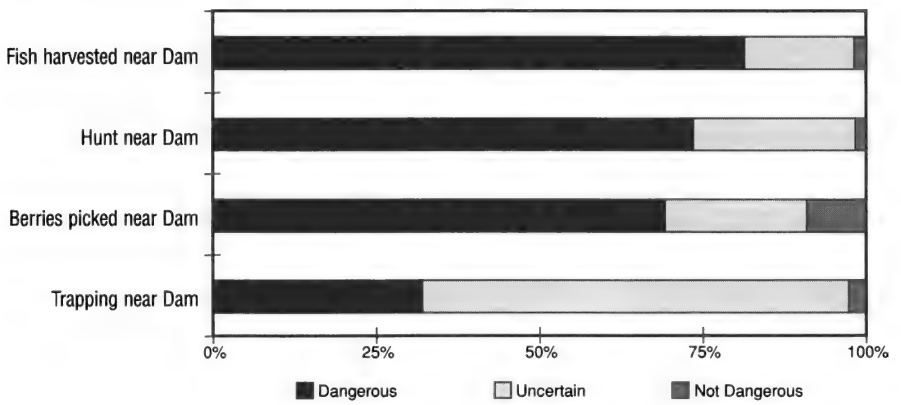
respondents agreed that animal populations would be disrupted or become unhealthy as a result of their proximity to the dam. Similarly, 79.2% of respondents agreed that fish spawning would be disrupted by the project, and 15.3% were uncertain. Each of these questions addresses the perception of broad ecological conditions, widely held understandings of animal behaviors, and responses to human influences on natural conditions. To paraphrase respondents' observations on these effects: animals always move in response to people so we can therefore expect them to avoid high activity areas around the dams. Those that do not move will undoubtedly be influenced by the changes, in some cases becoming ill. Fish have less overall mobility than land animals; their spawning will be disrupted by the dam.

Respondents were less certain of the specific effects such as birth defects in mammals, fish, and birds as a result of industrialization. Responses to this statement show a higher degree of uncertainty (30.6%) than the more general behavioural questions, perhaps because of the relatively infrequent appearance of birth defects and subsequent lack of direct knowledge. Additionally, some defects occur naturally and are seen occasionally in animals living in natural conditions before industrialization.

Three interview questions dealt with the possibility of human sickness developing as a result of eating animals harvested near the development site. The general response trend indicated a variable level of uncertainty, while the proportion of people disagreeing with the statement remained low. More than three quarters of the respondents agreed to the statement "people who eat a lot of country food get sick", while only 65.3% agreed to the statement concerning sickness from eating fish. This contradicts scientific information disseminated within the community on the risks associated with mercury contamination in fish populations.

So why is it that fewer respondents identified fish as a source of sickness than the more general country food category? We offer two interpretations to this question. The first is that the less specific category "country food" may address a generalized framework of resistance to the overall trend away from traditional lifestyles within the community, which is linked to hydro development. The second is that the nature of

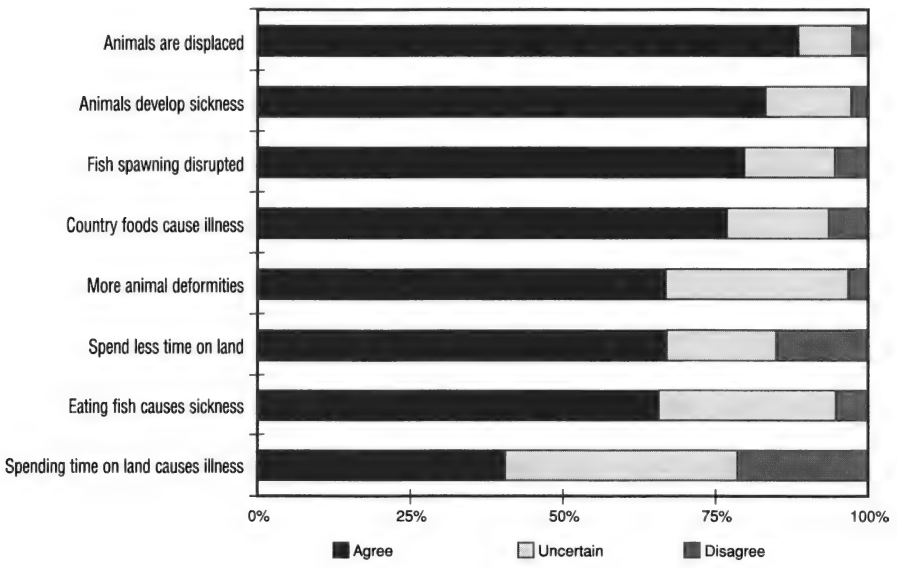
Table 4. *Perception of Development Impacts in Kuujjuarapik (n=72)*



scientific information is predictive and odds-based, and may not offer a clear understanding of the relationship between mercury, fish, and people. Mercury contamination became one of the key issues of debate regarding the suitability of the project, and one that received considerable media attention. Perhaps the availability of so much information, which is at times contradictory and often difficult to assimilate, leads people away from a concrete opinion about the effects, and towards a "wait and see" contingency, which is reflected in the responses to the "uncertain" category. This interpretation does not account for the high rate of "dangerous" responses associated with eating fish in the previous table, however. Results to these questions, while highly concordant, are still somewhat ambiguous.

The final sickness statement, "people who spend time on the land will get sick", provoked a different pattern of response than the others. Here, less than half of the people agreed with the statement, an almost equally large proportion were uncertain, and slightly more than 20% disagreed. Responses to this statement point to an understanding in the community that the health risks associated with hydroelectric development are largely linked to the consumption of affected animals. Regardless, 40.3% still agreed that health could be affected by travel on the land if the project were undertaken. The response to this question is probably closely linked to the high proportion of people who agreed that fewer people will want to spend time on the land as a result of hydro development (66.6%). This last question may address a general sense of rupture between people and the land base that could result from development.

Table 5. *Agreement Concerning Development Impacts on Land Use in Kuujjuarapik (n=72)*



Risk Perceptions of the Impact of Developments on Community Health

Table 6 describes risk perceptions related to changes in community health in Wollaston Lake. Once again, a similar pattern of perception emerges: as concern decreases, uncertainty increases. Agreement about risk is highest for those indicators that have been experienced first-hand, and where there is broad historical experience. For instance, the Denesuline are familiar with impacts associated with the boom and bust cycle of resource development. In 1982, the milling and mining operations at Uranium City closed, and by 1986, the 'town' status was abandoned when the population dropped to less than two hundred.[6]

Community respondents also shared a concern that some infectious diseases would persist or even increase with increased mining activities. Most (56.3%) agreed that there would be more outbreaks of meningitis. However, a large minority (37.5%) were uncertain if this would actually be the case. It is important to note that outbreaks of infectious diseases have long been associated with increased contact with Western society. At the same time, public health discourse has focused attention on the threat of infectious diseases. This discourse has been integrated into local knowledge and is drawn upon by some to explain cumulative impacts of mining, as illustrated by the following comment: "Everything around the mine that comes out of D-Zone causes disease. If one person gets it, the next person who they come in contact with would get it. It's contagious. Everything around D-Zone will be diseased."

This linkage of infectious diseases to the socioeconomics of uranium mining was also made for specific sexual transmitted diseases such as AIDS. The majority of the respondents (51.1%) agreed that the prevalence of AIDS might increase as a result of uranium mining developments, but many (40.6%) were still uncertain. Community members knew that uranium mining was not a direct cause of AIDS, but some believe that uranium mining opened up the north to southerners who may bring the disease with them.

Respondents were divided over whether or not people working at the mine are at increased risk for cancer (nearly half, or 46.9% agreed; 44.8% were uncertain). Respondents who agreed were aware of the link between cancer and radiation exposure, whereas others were unsure because they had not had direct experience with a case of cancer that could be attributed to uranium mining exposure.

The trend toward high uncertainty continued with statements projecting increases in "child birth deformities" (50%), "suicides" (54.2%) and "tuberculosis" (60.4%). This suggests that the community had little direct experience with these problems (an interpretation supported epidemiologically). In the absence of tangible evidence of the problem occurring, people in the community remain non-committal about risk.

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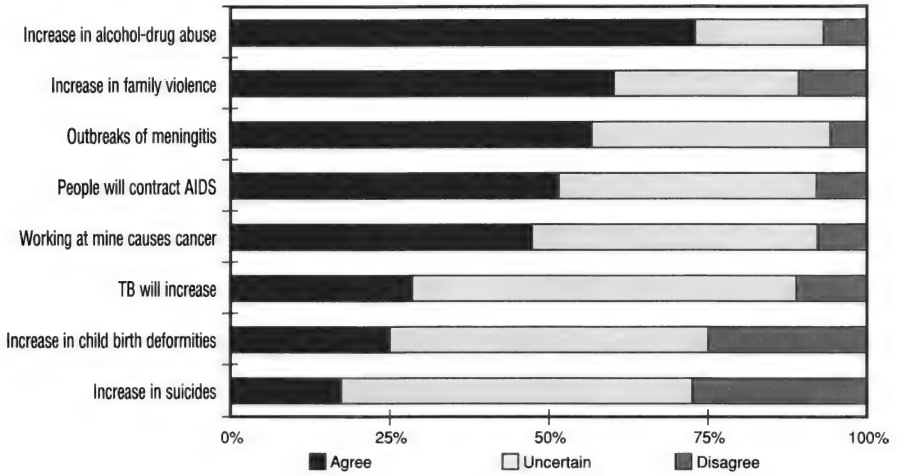
6. A recent study noted the impact of this closure on another northern Saskatchewan community (Ecologistics Ltd. 1992): there was a 50% increase in population with families returning to the community from Uranium City. Alcohol abuse and violence became so prevalent that the Medical Services Branch refused to place a nurse in the community for 19 months. Community members associated these problems with the cyclical nature of sudden increases in household earnings due to the employment of a family member, followed by a sudden decrease in earnings when they lose such employment, and the emotional upheaval it creates.

Table 6. *Agreement Concerning Development on Community Health in Wollaston Lake (n=96)*



Perceptions of community health risks associated with hydroelectric development in Kuujjuarapik are presented in Table 7; which shows considerably more variability in response rates and, in particular, higher degrees of uncertainty. Most people agreed that alcohol and drug abuse in the community would increase as a result of development (87.5%). Here people frequently made links between an increased income from jobs, the presence of more people from outside the community, and an increased availability of drugs and alcohol.

Respondents frequently agreed (70.8%) that the likelihood of STDs would increase. In this case, respondents made reference to experiences with other construction projects where STDs were introduced to the community by workers from the south. The question of STDs is a concern for many people. Elders have said that before there were regular contacts with white people there were no STDs. Again, people in the community place disease and risk into a historical context which focuses on interactions between Inuit and southerners. The issue of AIDS is currently receiving a lot of attention in the north, and condoms are widely available in public places. While fewer people agreed that the project could influence AIDS rates in the community than those who agreed that it could influence STD rates, they were still a majority (55.6%) and almost all of the remainder were uncertain (38.8%). The difference between STDs and AIDS response rates may reflect that fewer people are familiar with the latter illness.

A majority of the respondents were in agreement over three other statements in this table: a little over half of the respondents (55.6%) agreed that people who work at the project would get mercury poisoning, 52.8% felt that more people in the community would get sick, and 51.4% felt that family violence would increase as a result of the project. This last statement represents a different order of experience by linking decreased social harmony to development. In several cases respondents underlined the association between powerlessness to stop development with an increase in family violence. When we look at the responses to the statement concerning increases in

suicide we see the highest diversity in responses. Roughly one third responded affirmatively, 41.7% were uncertain and 22.2% disagreed. Suicide is perhaps the most painful issue for northern communities and one that is difficult to resolve. The divergence in responses to this statement may reflect the overall uncertainty that people have in comprehending and preventing this most serious of problems.

The final three statements in this table are marked by a majority in the "uncertain" response category. The relationship between TB, Meningitis, birth defects and industrial development are not commonly discussed in the community, although local experience with epidemic disease is considerable. Clearly, respondents have not considered links between these diseases and hydroelectric development to the same extent that they have formed opinions on the effects of development on the natural environment and mercury poisoning.

Overall, the findings of this section of the survey suggest that there is a high degree of concordance within the community about the effects of hydroelectric development on the natural environment and on the possible health effects to northerners who consume animals from the land. Less consistent are the responses to statements concerning social problems and disease issues within the community. In these questions there is substantially more variability of response and much higher rates of uncertainty.

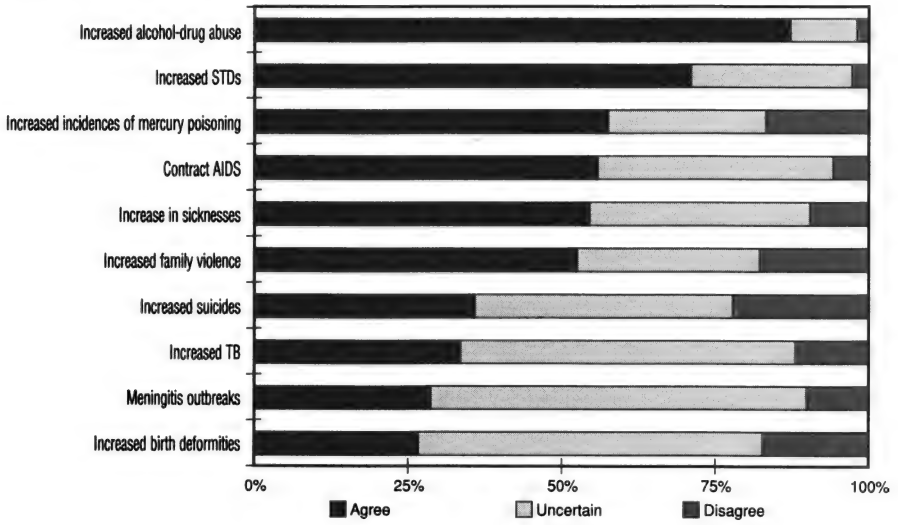
Local Risk Perception based on Local and Scientific Environmental Knowledge

We have identified a variety of patterns of risk perception in Kuujjuarapik and Wollaston Lake. In this section, we describe local knowledge processes and contrast these with scientific accounts of environmental impacts. Additionally, we review the role of locally-available sources of information about environmental change in shaping risk perception by people in the community.

There is a growing appreciation in the scientific community for what was once considered "folk knowledge". A number of traditional ecological knowledge projects in Aboriginal communities throughout the country demonstrate the contribution that local knowledge makes in broadening our understanding of impacts on such things as wildlife populations (Kuhn and Duerden 1996).

In many cases, Aboriginal hunters have easily been able to clarify points of animal behavior, ecology, and status for which biologists and others have incomplete information. While it is important to understand the status of animal populations, it is equally important to consider the relationship between animals and humans. In contrast to the reductionist approach of science, people in Kuujjuarapik and Wollaston Lake did not tend to see an animal or species as a conceptual isolate but rather as a series of interactions between other animals and people. In this sense, the scientific discourse on environmental impacts, which centers on defining 'territory' in terms of discrete units, of ecosystems, marine environments or drainage basins, species and so on, runs counter to an Aboriginal comprehension of nature. In their view, all ecosystems are linked, as are all animals. Terrestrial mammals will walk on the ice surface, drink from lakes and will be eaten by other animals that cover equally large territories. Rain falls on the land and the water without respect to boundaries, and marine mammals will move at their own will anywhere in the ocean environment. It is from this perspective that northerners feel that local source contaminants will be transported far from their origin, causing the flora and the fauna to be affected.

Table 7. *Agreement Concerning Development Impacts on Community Health in Kuujjuarapik (n=72)*



It is a standard cliché that Aboriginal peoples are somehow more attached to the land and more sensitive to the environment in general than are non-Natives. While this idea serves to romanticize life in non-industrialized societies, like many stereotypes there is an element of truth to it. The Inuit and Denesuline have a keen awareness of, and appreciation for, the land and wildlife. They frequently refer to their own participation in subsistence activities as being that of a caretaker relationship: one in which northerners must maintain a vigilance over the natural resources upon which they depend. When considering the scale of the Great Whale project, it is so large that it cannot help but to destroy the relationship that people have with the land, if not the land itself. One person stated:

> "The land is going to suffer, not just the animals, the land. Without talking about the animals, the land will suffer, the soil, the rocks, the tundra, the trees, the bushes; all these are going to suffer. Just for that it is not good. The animals will be greatly effected. The land will bear heaviness on the land. The place will no longer have innocence, innocence of the pure wilderness, the innocence will be totally gone and somehow the land will have man-made destruction." (Roy and Fletcher 1992: 69)

For some people at least, the extent of destruction of the territory is irrelevant, because "impact" is at the symbolic level.

The southern perspective of maintaining viable populations of species, with an exploitable surplus is not shared by all northern peoples. Their sense of population dynamics, which is based on direct observations and accumulated knowledge of many generations of hunters, is that the land is always full or becoming full again. When one species is rare, others are taking its place in abundance. In removing animals from the population, the hunter is freeing up space for another animal. This creates a healthy

population by allowing other animals to grow and live. The hunter occupies his place in this chain of existence by creating potential for growth in other species, thus assuring the continued survival of both the hunter and the hunted. It is a perspective typical of hunting populations that killing animals is ultimately a reciprocal act of kindness, allowing both humans and animal species to survive.

Northerners did not arrive at this theory of population dynamics without empirical evidence to support it. For example, the validity of the knowledge passed on from previous generations is often shown to be correct through the experience of the present. For nearly 100 years caribou in all of northern Quebec had been decreasing in number, to the point where until the 1950s people were reported to be starving to death. Various trader and government accounts drew a correlation between the widespread availability of repeating rifles and the population decline, and foresaw an inevitable elimination of the caribou. In the 1970s, Inuit and Cree from Kuujjuarapik chartered aircraft to fly inland to hunt caribou for the community. However, in the early 1990s there were literally thousands of caribou in the immediate vicinity of the community. Flying from Kuujjuarapik to Umiujaq, one could see a near continuous line of the animals along the entire coast, and many more inland. When interviewing hunters, they frequently made mention of the return of the caribou as a proof of the validity of what they had been told for many years by their elders — eventually the caribou will return. In an interview with one of the oldest men in the village, he said he has never seen this many caribou, but was not surprised because he had been told by his father that it had been like this before and that it would be again. That the caribou returned in such immense numbers, despite consistent hunting pressure, demonstrates that the hunt cannot kill off the species in entirety, and, in fact, caused it to recover. The warnings of non-Inuit, from Hudson Bay Company managers to Provincial biologists, that the caribou would be wiped out were shown to be false, and the Elder's predictions were shown to be true. The legitimacy of the cultural rationality is confirmed by empirical observation.

Many people view scientific assessment of impacts on animal populations from development with skepticism. For many Aboriginal peoples, the imposition of quotas and other restrictions on their harvesting of wildlife are, at best, misguided acts of badly informed administrators and, at worst, blatant attempts to control and change the Aboriginal lifestyle through the assessment of wildlife populations for purely political purposes. Risks to wildlife occur not from natural phenomena like hunting, but from the irrevocable unnatural destruction of habitat. In contesting the development of hydroelectricity and uranium mining, people in Kuujjuarapik and Wollaston Lake are also questioning the legitimacy of southern understandings of the dynamics of the natural world.

Conclusions

A distinct pattern of perception regarding traditional land use activities and community health risk suggests that the Denesuline and Inuit have long practiced cultural risk assessment, management, and communication activities. Traditional land use knowledge is used to mitigate the dangers of land use activities. Reliance on this knowledge has created confidence, and community members are secure in their ability to assess the impact of certain developments on their health, especially when they draw upon traditional knowledge. This stresses the importance of incorporating community understandings of health into the environmental impact assessment of development projects.

Small, but nonetheless considerable, levels of uncertainty also suggest that perception is context-specific, and that it can converge with other cultural knowledge systems, like those of Western society. Relatively high levels of uncertainty also suggest that uncertainty in risk perception is part of a cultural approach to survival and should be viewed positively. However, there is also a great amount of uncertainty and divergence of opinion when people lack either historical or recent experience with a potential environmental health threat. To some extent, Western explanations are adopted and adapted when they are compatible with local cultural understandings. However, uncertainty is enhanced when local cultural and Western explanatory frameworks are either in conflict, or, as is usually the case, simply disconnected.

Risk perception is therefore a product of several key factors. First, traditional cultural understandings of risk include relatively high levels of uncertainty that place positive values on remaining open to contingency and context. Second, when particular health problems are significant to the community, these problems are likely to be strongly associated with general environmental threats. Third, people maintain a high level of confidence in their ability to detect problems in their food and other "traditional activities", and are relatively resistant to external information that may suggest health risks. Finally, uncertainty as a positive traditional value, when compounded with conflicting information, creates enormous ambiguity in risk perception.

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Recreation and Community Health: Evaluation of the Northern Recreation Director Training Program (NRDTP) for Selected Aboriginal Communities in Manitoba

Karen Fox[1] and Sean Ryan[2]

The health of any community rests on a variety of factors, including leisure and recreation opportunities. Recreation is an activity that individuals undertake for personal and social benefit. Recreation is usually characterized as socially purposeful and acceptable, good for both individuals and society, and provided by social institutions that adhere to the positive aspects inherent in recreation activities (Rossman 1995). The Aboriginal Justice Inquiry's recommendation for increased opportunities and quality of recreation for Aboriginal young people coincides with research findings that recreation is a vital and necessary component of a community to support health and resiliency in families and young people (Silbereisen and Todt 1994).

The Northern Recreation Director Training Program (NRDTP) was jointly developed by the Departments of Culture, Heritage, and Citizenship, Northern Affairs, and Education (New Careers) as a response to a request for increased recreation opportunities by Aboriginal communities north of the Northern Affairs boundary in Manitoba. The NRDTP was designed as a two year, twelve module program in 1995 to provide a foundation in professional skills and concepts related to recreation for individuals in Aboriginal communities.

This research assessed how the NRDTP influenced the quality of life and increased recreation benefits in the participating communities by: (1) expanding the community's awareness of leisure activities and benefits; (2) presenting positive structured recreation

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options that may affect the pursuits of "negative leisure time activities"; and (3) supporting professional recreation practices.

Methodology

The methodology was originally designed to be as unobtrusive as possible and to utilize multiple indicators and sources in order to ensure the validity of outcomes. A combination of questionnaires, interviews, group discussions, and observation was implemented over a two-year period. Participating communities were categorized according to the number of training modules completed: communities with individuals who graduated from the NRDTP (4); communities with individuals who completed ten or more NRDTP modules (5); and communities that completed less than 10 NRDTP modules (4). The participating communities encompassed Cree, Ojibwe and Métis cultures. Local communities chose and supported the individual Recreation Trainees through the NRDTP.

The data collection phase focused on the four themes of the questionnaire: recreation facilities, recreation program development, recreation advisory committees, and volunteer leadership. These themes reflect normative recreation program standards of non-Aboriginal communities and were developed during the Northern Recreation Director Pilot Project (NRDPP). Other information relevant to new themes and cultural issues was collected through interviews, observations, focus groups, and conversations with Culture, Heritage and Citizenship and Northern Affairs staff, recreation trainees, community leaders, and community representatives. The baseline data was collected in 1995 and the final collection process occurred in 1997. The analysis phase traced the four recreation themes as well as emerging themes about recreation benefits and cultural issues relevant to specific communities.

The primary limitations of the data and analysis include (1) the small number of communities within each category and (2) unreliable estimates of participation since few records were kept about participation in recreation events. Information was collected from various sources and subjected to a detailed analytical process. The quantitative data are reported as raw data or simple percentages and must be used with caution. Overall, the sample size is not sufficient for reliable statistical analysis. In addition, individual communities in this report were often too small to be considered alone for national data such as census. Therefore, the comparisons between participation estimates and RCMP or Statistics Canada data are tenuous because of the difference in data collection strategies, categories, and analysis. Qualitative information was recorded as reported and, in cases where responses were similar or duplicated, frequency was indicated.

Two of the main areas that assessed the influences of the NRDTP are recreation program development and volunteer leadership. These two areas represent the significant recreation changes within the communities and emphasize the culturally complex issues involved with transferring non-Aboriginal leisure and recreation practices to Aboriginal communities.

Recreation Program Development

Recreation programming (i.e., all elements including program idea, implementation and evaluation) is the heart of any recreation program, and the element most connected with the role and function of a recreation director. It is through program development that a recreation director addresses the needs of the community and attracts new

participants. The major area of change in communities related to the NRDTP are being involved in the planning and delivery of recreation programs. Overall, the Recreation Trainees:

(1) used facilities more often and for more programs,
(2) provided a greater number and range of recreation programs,
(3) raised the frequency of participation by community members,
(4) attracted new participants to recreation programs,
(5) included different segments of the population,
(6) programmed more special events, and
(7) increased programs for specific recreational needs and benefits.

The Recreation Trainees extended the range of activities for existing recreation facilities. For example, almost all of the communities maintained an indoor ice rink, and in order to support the associated utility costs, the Recreation Trainees focussed on maintaining present programs while including different population segments (e.g., initiating a women's hockey league). Recreation Trainees creatively used the same facilities for Canada Day Pow Wows, hot lunch programs for school children, and magic shows.

Therefore, existing facilities had an increase in activity level, participant attendance, and types of programs (Table 1).

All of the communities with individuals who graduated or completed ten or more modules witnessed the growth of the recreation program. The actual number of recreation programs increased by 40% over the two-year training period. The percentage analysis suggests that sports and physical activity, at 49% of the total, dominated the resources of recreation (Table 2). This focus may be related to community interest, financial restraints, or underlying barriers related to gender or non-physical activity programming.

The Recreation Trainees added new offerings to the recreation program, appealing to different segments of the population. For instance, playground programs, drop-in centres, Moms and Tots, and additional physical activities were aimed at children and youth. One community initiated a walking program for older adults while another directed its program toward people with diabetes.

Recreation Trainees used special events to address specific recreation needs and to promote recreation for the entire community. Father's Day picnics and Fishing Derbies helped connect parents and adults with children. Cultural traditions were highlighted through Treaty Day celebrations, Pow Wows, Heritage Days, and Aboriginal games. In fact, the increase from 19% to 25% of total programming devoted to cultural activities was due primarily to special events.

All of these innovations led to an increase in the estimated number of people attending recreation programs (Figure 1). Estimates reflected both regular programming attended by local people and special events attended by people from surrounding areas. Comparison of the various estimates suggested that frequency of participation by individual members rose, a variety of recreation activities attracted new people to recreation, and special events brought in individuals from surrounding areas. Overall, the changes in recreation programming enhanced the quality of life in the communities through associated benefits. Research (Driver *et al.* 1991) demonstrates that the benefits of recreation affect both individuals and communities (Table 3). The benefits for individuals include physical fitness, self-esteem, skill competencies, and problem

Table 1. Community Facilities and Types of Recreation Programs for 1996 for the Communities of NRDTP Graduates

FACILITIES	PROGRAMS
Indoor Ice Skating Surface/Arena	Bingo, Bowling, Broom Ball, Coed Sponge Ball, Curling, Drop-In Centre, Figure Skating, Hockey (Minor, Recreational, Roller, Ball), Hot Lunch Program, Brian Glow Magic Show, Wellness Gathering, Youth Entrepreneurial Program, Summer Activity Night
Curling Rink	Curling
School	Badminton, Basketball (Team, 3 on 3), Floor Hockey, Gym Nights, Outdoor Program, Volleyball
Community Hall	Bingo, 4H Club, Movie Nights
Baseball/Softball Park	Baseball (Minor, T-Ball, Little League), Fast Ball, Slow Pitch (Girls, Teen, and Coed), U-Ball, Treaty Day Activities, Heritage Day Activities, Winter Carnival, Horseshoes
Playground	Summer Play Program
Bowling Alley	Bowling League
Cree Camp	Eagle's Nest Camp
Rodeo Grounds	Rodeo
Batting Cage	
Outdoor Skating Rinks	Recreational Skating
Swimming Beach	Swimming Program
Senior Centre	Senior Crafts Program
Drop-In Centre	Programs for Children and Youth Summer Day Camp

Table 2. Comparison of Recreation Programs by Type

PROGRAM TYPES	PERCENTAGE IN EACH PROGRAM TYPE	
	1995	1996
PHYSICAL RECREATION OR SPORT ACTIVITY	49%	49%
NON-PHYSICAL, SOCIAL OR CREATIVE RECREATION	32%	26%

solving abilities. The benefits for communities include reduced level of criminal activity, increased commitment to community programs, economic development, and cultural connections.

The percentage of programming for sports and physical activity remained the same (49%) over a two-year period. Part of the rationale for these activities is related to decreasing criminal activity, which affects primarily youth and adult males. Comparing recreation participation and crime rates suggested that criminal activity decreased during the two-year period (Figure 2), which is consistent with other research in this area (Winther and Currie 1987). However, such an emphasis must also be examined in relation to gender, ability, and culture. It was beyond the scope of the evaluation to address this question definitively.

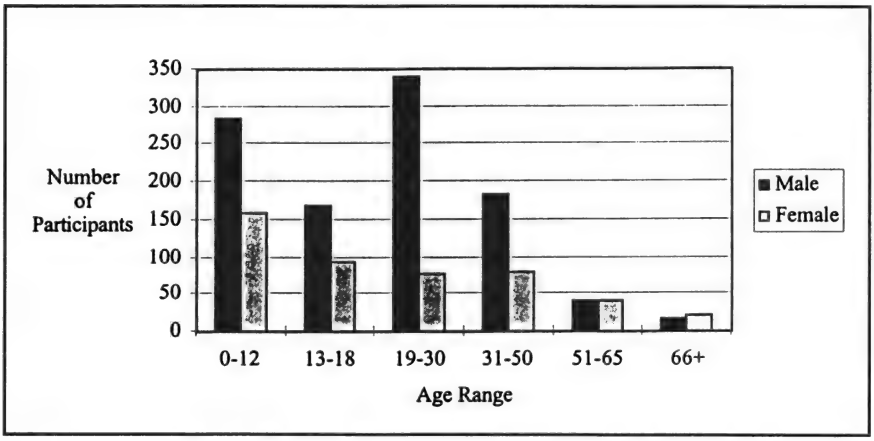


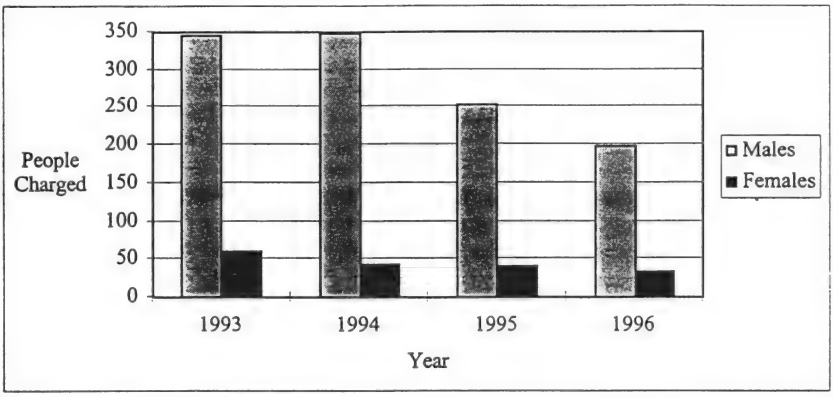
Figure 1. *Participation in recreation in 1996*

Table 3. *Community Programs and Recreation Benefits*

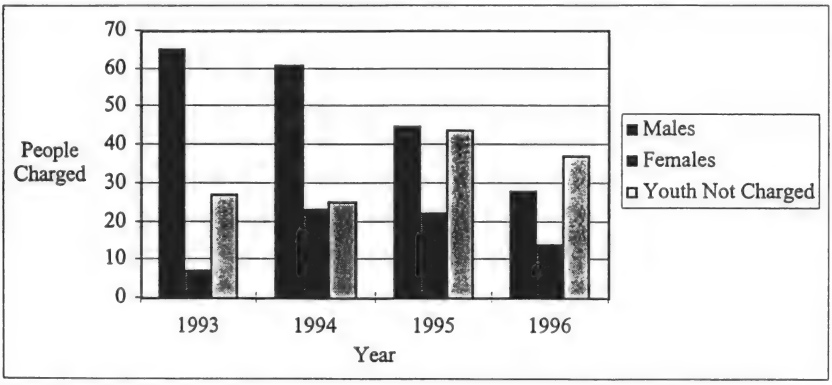
Recreation Benefits	Communities with Graduates				Communities with Individuals who Completed 10 or more modules					Comparison Communities			
Communities	**4**	**3**	**1**	**2**	**7**	**8**	**6**	**13**	**5**	**9**	**10**	**11**	**12**
Health	4	3		1	2	2							
Psychological	4		1			2							1
Economic	6	3	2		1	3							4
Sport	16	17	9	10	5	9	6	11	7	11	6	8	7
Family & Child Development	6	3	2	1	2	4	1		1			1	3
Sociological	10	6	8	8	3	4	2	5	3	5	3	2	5
Community Development	3	1		1		2							2
Entertainment	2	3	4	1		1	1	1	1	1	1	1	1
Education		2											
Special Events	4	3	1	1	2	2	1	1	2	1		1	3
Spiritual		1				1							
Environment	2	2	1			2		1					
Professionalism	6	3	3	5		4							2
Community Totals	63	47	31	28	15	36	11	19	13	18	10	13	28
Group Totals	**170**				**81**					**69**			

Interviews suggested that emphasis may, in part, reflect gender issues. First, an emphasis on sports and physical activities may favour males over females. This conclusion was partially supported by participation rates, which show 1034 males participating in sports and physical activities in communities with NRDTP graduates. This compared to a participation rate of 472 females in sports and physical activities. Second, the difference in participation between males and females may be related to constraints. Women, on average, encounter more barriers to participating in sports and physical activities (Henderson *et al.* 1996). Therefore, programs designed specifically for female participation (e.g., ringette, women's hockey, or girl's and women's skill clinics) will increase the level of participation by Aboriginal women. Third, the types of sports and physical activities did not appeal to most of the girls and women. If the range of sports and physical activities was more varied, the participation of girls and women might increase. Finally, sports and physical activities may not appeal at all or conflict with other cultural values and preferences of girls and women in the communities.

Continued emphasis on sports and physical activities may also prevent the Recreation Trainees from initiating new programs or addressing other recreation needs. Without assistance, there is a limit to the number of programs one Recreation Trainee can effectively coordinate. For instance, recreation activities designed for seniors, people with disabilities, or family units are often within the category of social interaction, which experienced a decrease in frequency to accommodate the increase in cultural activities. These programs are especially difficult to initiate and maintain because they require behavioural and value changes, support from the entire community, and additional leader positions.



Note. 1995 and 1996 data includes community information based upon 10 or 11 months only.
Figure 2. Adult crime rates for three of four communities with NRDTP graduates and one community that completed 10 modules.



Note. 1995 and 1996 data includes community information based on 10 or 11 months only.
Figure 3. Youth crime statistics for three of four communities with NRDTP graduates and one community that completed 10 modules.

Figure 2. *Adult and youth crime rates in communities with NRDTP graduates.*

Volunteer Leadership

A recreation program that meets a variety of community needs requires community leadership and support, professional staff, and individual leadership and participation. The Recreation Trainees often had ideas for new programs, which would require additional leadership. If a recreation program based on non-Aboriginal models is to deliver associated benefits and become self-sustaining, the community must commit resources and leadership in addition to professional positions. It is not recommended, possible, nor is it healthy for the individual or community, that the Recreation Director be entirely responsible for an entire recreation program. The issue of staff or community leadership is vital for the survival of ongoing recreation activities and the development

of new ones. While the need for community leadership and assistance with recreation programs was clear, the solution was not so obvious. In non-Aboriginal communities, involvement of additional people was achieved through a volunteer system. Cross-cultural research (Chevannes and Hansel 1990) indicated that the volunteer concept is deeply intertwined with socioeconomic status, gender expectations, and educational levels. Although many cultures have specific values and structures for service or reciprocal giving, the concept of "work without pay" (i.e., volunteerism) does not make sense in many cultures. Furthermore, volunteering required personal skills and attributes, literacy and education, self-confidence, and an ability to work in groups. For any volunteer program to work, there must be a combination of social climate, underlying cultural values, and personal competencies.

From the questionnaires and interviews, there were some initiatives related to volunteer leadership. The total number of volunteers ranged from as few as four to over a hundred and, in most communities, the numbers increased from 1995 to 1996, especially for youth and females (Table 4). Interviews and focus groups with community leaders indicated that the number of volunteers had increased as a direct result of the NRDTP. Recreation Trainees used a variety of strategies to attract volunteers including formal recognition, requiring parental volunteer time for children to participate, and personal requests. In many cases volunteers were the friends or relatives of the Recreation Trainee. Therefore, "typical" volunteer practices such as formal applications, skill and performance training, and evaluations were difficult to implement and could be considered an insult to people in family-based communities.

Often, community members did not understand why they were volunteering to work on a recreation program. The belief was that the Recreation Director should be providing the services because he or she was getting paid to do so. When you consider the reasons why people volunteer (e.g., to obtain job skills, to network with potential employers and to give to those with "less"), these reasons are often missing in a small community where unemployment is high, choice of activities limited, and cultural identification doubtful. Therefore, cultural differences, socioeconomic realities, and community interrelationships made the transfer of volunteer concepts and structures problematic.

If the existing recreation programs were to be sustained and new programs developed, community participation and leadership above and beyond the involvement of the Recreation Director is required. Although Euro-North American communities have relied upon volunteerism, it may not be practical or appropriate for Aboriginal communities. If practical and supported, volunteer programs aimed at children and youth may create the skills and values necessary for later adult involvement. If volunteerism is not practical, appropriate, or supported, communities may need to develop values, systems, and behaviour that will be culturally appropriate, will aid in sustaining existing recreation programs, and contribute to the development of new programs.

Conclusion

Recreation is a vital component of any community development strategy and the Northern Recreation Director Training Program (NRDTP) was designed to support such initiatives in Aboriginal communities north of the Northern Affairs boundary in Manitoba. The two indicators (recreation program development and volunteerism) discussed in this paper were chosen because they represent a transfer of recreation skills

to NRDTP communities and the ongoing cultural challenges for sustaining viable and appropriate recreation programs in Aboriginal communities.

Recreation program development was improved through better organization, increased variety of recreation opportunities, inclusion of new population segments, and specific programming for recreation benefits. Comparison with crime statistics and personal anecdotes indicated that the communities experienced a decrease in crime and an increase in positive social interaction. Conversely, a primary emphasis on sports and physical activities may exclude specific segments of the population, or conflict with Aboriginal cultural values. For instance, the needs of young males at risk of criminal involvement are addressed, while the needs of young females at risk for pregnancy or prostitution remain unresolved in recreation programming.

All recreation programs need community leadership and involvement. Recreation leaders provide energy and enthusiasm, specific expertise, and role models for children and young adults. The Euro-North American volunteer system may or may not be appropriate or effective in these communities. Therefore, analogous systems need to be explored in order to continue to receive benefits of recreation.

In conclusion, two of the components and structures of recreation programs in non-Aboriginal communities may be appropriate and necessary for those in Aboriginal communities. These elements may provide organization, professional boundaries, and effectiveness for recreation efforts in Aboriginal communities and help achieve the

Table 4. *Change in Number of Volunteers 1995-1996*

MALES

	Age Groups	0-12	13-18	19-30	31-50	51-65	66+	Total
1995	Graduated	0	10	20	5	15	10	60
	Partial	8	6	3	20	12	5	54
	Comparison	0	7	4	0	0	0	11
1996	Graduated	4	20	17	24	7	3	75
	Partial	0	12	11	43	1	0	67
	Comparison	0	3	33	7	0	0	43

FEMALES

	Age Groups	0-12	13-18	19-30	31-50	51-65	66+	Total
1995	Graduated	0	10	20	5	20	10	65
	Partial	7	4	4	25	4	2	46
	Comparison	0	6	3	0	0	0	9
1996	Graduated	4	28	15	44	2	3	96
	Partial	3	14	17	52	2	0	88
	Comparison	0	2	34	6	0	0	42

Note 1. 1995 represents one community for graduated, partial, and comparison groups
Note 2. 1996 represents 3 graduated communities
Note 3. 1996 represents 2 communities for partial and comparison groups

specific recreational benefits needed to address community needs. The training structure of the NRDTP has supported a better quality of life through recreation for communities with Recreation Directors who graduated or completed ten or more modules. However, there are cultural differences that require examination of values and value-connected behaviours and structures typical in recreational frameworks if the recreation programs are to be appropriate and effective in Aboriginal communities. Culturally appropriate recreation (Allison 1998, Fox 1993) provides a vehicle for self-determination. Recreation, therefore, becomes vital for the well-being of Aboriginal people who are striving to determine their futures and create healthy prospects for their children. The opinions of communities north of the Northern Affairs boundary in Manitoba, the accomplishments of the graduates of the NRDTP, and the recommendations of the Aboriginal Justice Inquiry provide a compelling argument to continue and ultimately enhance quality recreation programs in Aboriginal communities in Manitoba.

Acknowledgement

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Might Vitamin D Deficiency be an Issue in the North?

Pam Smith[1]

Vitamin D is required in maintaining calcium metabolism. Deficiency is currently thought to be uncommon in North America, and is considered important only when it results in rickets or osteomalacia. Rickets is a condition that impairs young children's bone growth as a result of incomplete mineralization — a weakness that can lead to bowed legs and other skeletal deformities, that can be permanent. Many children with rickets suffer life-threatening hypocalcemic seizures (Haworth 1995) in addition to abnormal bone growth. One recent case from Manitoba suffered cardiorespiratory failure (Moffatt 1995). The primary risk factor for developing rickets is vitamin D deficiency of the mother during pregnancy. Infants are born with a store of vitamin D, the adequacy of which is determined by the adequacy of their mother's levels. Osteomalacia is the adult version of rickets and causes weakness, pain, and difficulty walking.

Vitamin D is produced by the body when skin is exposed to certain ultraviolet rays of sunlight. Production of the biologically-active form is regulated and acts at a site distal to its production. As such, it is a hormone and not a nutrient (Pitt 1991). Although very few foods contain vitamin D, it can be added to foods. The theory that rickets can result from a lack of vitamin D has been challenged by research that has shown that very little sunlight is required to produce sufficient vitamin D: as little as 10-15 minutes, 2-3 times a week on hands, arms and face only, for the elderly in Boston (Holick 1991). Also, vitamin D is acquired seasonally and stored. This is important at latitudes where the availability of the appropriate ultraviolet rays is restricted for much of the year (Webb *et al.* 1988).

Since the discovery that vitamin D could be manufactured and added to the human diet via food fortification or vitamin supplements, deficiency is considered to be resolved. Public health efforts in Canada lead to the vitamin D fortification of fluid milk; in Manitoba, milk has been fortified since 1968 (Barsky 1968). Rickets has since been virtually eliminated for most Canadians.

Despite the success of oral vitamin D in the prevention of rickets, or perhaps because of it, the specific etiology of the deficiency is unclear (Clements and Fraser 1998, Fraser 1998). Vitamin D is used most efficiently when it is in short supply (Fraser 1983) and may not be the most important factor in rickets etiology (Walters *et al.* 1992). Calcium

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homeostasis is controlled in a feedback loop involving many factors (Fraser 1995). Low calcium consumption, or low bio-availability, may increase vitamin D needs due to increased metabolic inactivation of vitamin D.

Potential Significance of Vitamin D Deficiency

That subclinical (not apparent upon physical examination) vitamin D deficiency might be widespread is of interest for many reasons. Vitamin D fills a biological role beyond whole-body calcium homeostasis (Clements *et al.* 1987, Fraser 1995). Vitamin D receptors are present in most nucleated cells of the body (Braidman and Anderson 1985, Pols *et al.* 1990). Their purpose is not well understood, which has made some researchers wary of using oral vitamin D as a supplement, especially in higher doses, since it may cause vitamin D levels to rise much higher than ever can be reached as a result of exposure to the sun alone (Elidrissy 1991, Fraser 1995, Paunier 1991). Hypervitaminosis D never occurs as a result of sun exposure.

Blood tests can reveal subclinical states, but whether or not these are considered important depends on their effects. Some subclinical states merely demonstrate that a person is at risk of developing an adverse condition. Others are detrimental in their own right. Subclinical vitamin D deficiency is not considered to be a problem; however, it can indicate a risk of the development of rickets in offspring, or less frequently, the development of osteomalacia in later years. Recent research in the elderly has shown concern for the effects of low vitamin D levels and their role in osteoporosis (Yendt 1994).

It is possible that subclinical vitamin D deficiency is more important than realized, and may adversely influence the health of adults and their children, in ways unrelated to, and more common than, rickets and osteomalacia. Low vitamin D levels may have a role in susceptibility to infections (El-Radhi *et al.* 1982, Lorente *et al.* 1976), dental caries (Mellanby 1918, Smith and Moffatt 1996), osteoporosis (Yendt 1994), hypertension (Repke 1994), and diabetes (Boucher *et al.* 1995, Smith 1997). In this paper I discuss the role of vitamin D deficiency in Baby-Bottle Tooth Decay (BBTD), or nursing caries.

BBTD is the rapid and extensive destruction of the primary teeth of very young children and is characterized by decay of the surfaces which are usually not susceptible to decay: the smooth surfaces of the front teeth. BBTD is rare (less than 5%), except in certain sub-populations, such as Aboriginal people in North America, who have rates as high as 100% and almost always over 50% (Milnes 1996, Ripa 1988). BBTD is painful and often involves dental surgery to remove damaged teeth.

Dental caries is an infectious disease which can occur over time in the presence of bacteria and sugar (Ripa 1988). Other factors such as oral hygiene and characteristics of saliva are believed to play a role. The literature describing risk factors for BBTD focuses on maternal infant feeding behaviours, and uses terms such as "improper parenting" (Ripa 1988) and "feeding abuse" (Babeely *et al.* 1989), as evidenced by prolonged bottle or breast feeding, sweetened feeds, and nap-time feeds. BBTD is believed to be entirely preventable by changing feeding practices, but effective prevention has proven elusive. There are problems with this theory, and the condition appears more closely associated with socioeconomic status than with feeding practices (Smith and Moffatt 1996).

It is known that calcium and vitamin D are important for tooth development. Nikiforuk and Fraser (1982) found hypocalcemia (low calcium) to be the unifying factor

in enamel defects. Defective teeth are more susceptible to decay (Rugg-Gunn 1993) Thus, defective development during gestation could produce deciduous teeth which are liable to decay.

Early this century, experimental evidence in dogs established that vitamin D deficiency can produce enamel defects in teeth (Mellanby 1918), and that the addition of vitamin D to a diet adequate in calcium led to a reduction in caries in children (Committee for the Investigation of Dental Disease 1936). However, defective teeth are rare. Another study early this century looked at less obvious defects of the dentine and enamel and found an association with low socioeconomic status and caries (Mellanby 1934). Bacteria and sugar might be expected to selectively devastate susceptible teeth.

Existence of Vitamin D Deficiency in the North

The Island Lake area has the highest incidence of rickets in Manitoba. Forty of 48 cases seen in one Manitoba hospital between 1972 and 1984 were Aboriginal: 18 were from Island Lake and 22 were from 18 other communities (Haworth and Dilling 1986). Actual rates are unknown as many cases are not diagnosed and only severe cases are sent to the hospital (Moffatt 1995). A 1974 study of the diets of preschool children found inadequate intakes for the majority of children in one Island Lake community (92% for vitamin D, and 65% for calcium) (Ellestad-Sayed *et al.* 1981).

The high incidence of rickets in Island Lake reflects the widespread deficiency of the mothers and likely the rest of the community as well. A 1987 study of randomly-selected mother-infant pairs from two of the Island Lake communities found that 43% of infants and 76% of mothers had vitamin D levels below the lower limit of normal (Lebrun 1988, Lebrun *et al.* 1993). Normal, however, is not well defined. Lebrun *et al.* used the lower 'lower limit of normal'. Applying the upper value of the 'lower limit of normal' from the literature to the 1987 data from Island Lake changes the percentage of mothers below "normal" from 76% to 93%. However, a biochemical measure of vitamin D status, taken during June and July when maximum ultraviolet light was available, indicated that the vast majority of recent mothers were vitamin D deficient.

Osteomalacia, the adult version of rickets, causes weakness and fatigue as well as muscle and bone pain, walking difficulty, and an irregular gait (David 1991). A study in Berlin found that osteomalacia in mothers was not diagnosed until rickets was found in their infants, despite several physician consultations regarding symptoms (Park *et al.* 1987). The high rates of subclinical vitamin D deficiency in Island Lake may also mark the existence of unrecognized osteomalacia.

Nutrition studies have consistently reported that the diet of Aboriginal people in Canada does not contain sufficient vitamin D and calcium to meet recommended intake levels. In Cross Lake, another northern Manitoba community, 30% of the children consumed less than the recommended amount of calcium, and 77% consumed less than the recommended amount of vitamin D (Ellesta-Sayd *et al.* 1981). One study of women and children in five northern Manitoba communities found that over 40% of students and over 50% of women consumed less than 70% of the recommended amounts of calcium (vitamin D was not assessed) (Sevenhuysen and Bogert-O'Brien 1987).

A study of nutrient intakes and food consumption patterns in mothers and school children was conducted in two communities in Northern Alberta, one with a school lunch program and one without (Wein *et al.* 1992, 1993). In the community without the lunch program, 64% of mothers and 71% of children had calcium intakes less than

two-thirds the recommended levels, and 36% of mothers and 44% of children had vitamin D intakes below two-thirds of the recommended levels. The corresponding values for the community with the lunch program were 56% and 34% for calcium and 44% and 0% for vitamin D (Wein *et al.* 1993). Another Alberta study of adults in two communities found that nutrient intakes were likely to be inadequate for 59% of the sample for calcium and 20% for vitamin D (Wein *et al.* 1991).

A dietary survey of women of child-bearing age, preschool children and older adults in three Manitoba communities found probability estimates of inadequate intakes for calcium of 21%, 36%, 56%, 67%, 87%, 89% for children under 2 years, children between 2 and 4 years, women 16-24 years, women 25-45 years, women 56-74 years, and men 56-74 years, respectively (vitamin D was not assessed) (Campbell *et al.* 1992). In Igloolik, the mean daily intakes did not meet the Canadian Dietary Standards for vitamin D for 1 to 3 year-olds, and for calcium for 4 to 6 year-olds (Ellestad-Sayed 1977).

The Indian Survey Report (Health and Welfare Canada 1975) prepared by Nutrition Canada in 1975 was intended to study a stratified random sample of Aboriginal people across Canada but met with very high non-participation rates (Moffatt 1989). None of the Island Lake communities were selected for sampling. Fully 71.2% of pregnant women had a calcium intake of <700mg/day (which was considered adequate), compared to 26.8% of the national sample, and 71.3% had vitamin D intakes of <150IU/day (less than 40% of the recommended daily allowance) compared to 29.8% of the national sample (Health and Welfare Canada 1975). This survey did not measure serum vitamin D metabolites.

Although dietary intake studies are complicated by the high variability in eating patterns, the difficulty in quantifying serving sizes and calculating nutrient intakes, and the lack of understanding of interactions and bio-availability, the evidence consistently suggests that Aboriginal people consume less calcium and vitamin D than other Canadians. In 1978, (Dilling *et al.* 1978) research suggested that "subclinical vitamin D deficiency may be a widespread problem in Indian communities and this should be investigated."

Potential Relevance of Vitamin D Deficiency to Aboriginal People

In Island Lake, where almost all of the mothers had low vitamin D status and rickets is common, the tooth decay rate for six-year-olds is 1.4 times higher than for other Aboriginal communities (Leake 1992), which is already 3.5 times higher than for rural Manitoban six-year-olds (Cooney *et al.* 1993). Approximately 75% of the children have "rotten baby teeth" and almost half of all the children have dental surgery under general anaesthetic in Winnipeg hospitals (Smith 1997).

In support of the theory that defective teeth may be widespread and may have a role in the high rates of caries, a study of tooth morphology reported higher rates of micro- and macro-scopic tooth defects in the teeth of adult Alaska and Greenland Aboriginal peoples compared to American non-Aboriginal peoples (Pederson and Scott 1951). Historically, baby teeth were not subject to this form of extensive decay. To blame the baby bottle, which was not available in the past, is not enough. One study found that 22% of Inuit children with this form of tooth decay had never been bottle fed (Albert *et al.* 1988).

The association of rickets susceptibility to infections and tooth decay is important for Aboriginal peoples as they experience high rates of infections and dental caries. The

association of vitamin D deficiency, with hypertension, and impaired insulin metabolism is significant because cardiovascular problems and diabetes are responsible for a large proportion of the morbidity and mortality of Aboriginal people. Lower bone mineral density has also been found in Aboriginal people (Evers *et al.* 1985).

Why Might Vitamin D Deficiency Exist?

Although many remote communities share the common risk factors associated with rickets (low socioeconomic status, nutritional deficiencies, high latitude), the factors which predispose the Island Lake area to rickets are unknown. It has been suggested that the use of the *tikinagon* (an infant carrier which involves swaddling) restricts sun exposure, causing children to develop rickets (Lebrun 1988). However, this does not explain a deficiency in mothers. Because the deficiency originates with the mother, explaining rickets in Island Lake by a reduction in sun exposure in infants, would indicate widespread deficiency in the north. It suggests that otherwise similar communities are likely vitamin D deficient, but the increased sun exposure of infants hides the problem. BBTD may be a more sensitive indicator of the deficiency than rickets, and the distribution of BBTD may indicate the extent and magnitude of the problem.

Why might the mothers, and others, be vitamin D deficient? Further north, less time is available during the year to produce vitamin D from sunlight. Clothing styles, and methods of shielding against insects, reduces sunlight exposure in the summer when the sun's rays are able to generate vitamin D. Many lifestyle characteristics may account for reduced sun exposure, but recent research indicates that even casual exposure to sunlight is adequate. Low dietary intake could be attributed to low levels of milk consumption. Milk (fortified with vitamin D in Canada), is not part of the traditional Aboriginal diet. Milk prices are very high throughout the north; availability and refrigeration also present problems.

Perhaps the primary deficiency is not vitamin D, but calcium. Chronic low calcium intakes are associated with impaired vitamin D metabolism and can manifest as vitamin D deficiency. The dietary intake studies consistently report low calcium and vitamin D intakes. Extensive tooth decay and diabetes were not a problem in the past. Those who have changed their traditional diets the least have the lowest rates of these conditions.

The Aboriginal diet has changed significantly, as has the ability for families to follow healthy diets. A reduction in land foods has led to a dependence on expensive store foods, yet most families have low incomes. The changes in the diet have historical roots in the colonisation process which has led to the social context of today's health problems:

> Under-nutrition/malnutrition of Canadian native people may be considered a direct consequence of lessened intake of traditional foods combined with government inattention to the effects of dietary and economic shifts [(Farkas 1978:1)].

As a result of poor socioeconomic conditions, nutritional problems other than calcium and vitamin D deficiency are common among Aboriginal people, including problems resulting from a lack of iron, vitamins A and C, thiamin, riboflavin, and folate. Many of these nutrients are available from fish and organ meats (Farkas 1978, Rose 1992).

The focus of this paper has been on problems related to Vitamin D and calcium deficiency in northern populations. Other deficiencies may be as, or more, important to health, and their inter-relatedness is not fully understood. The overlap of multiple risk factors and socioeconomic status suggests that "[w]e must distinguish between *agents* and *causes*" (Lewontin 1991:45). The disproportionate burden of illness experienced by Aboriginal people is influenced by "poverty, unemployment, poor housing and sanitation, geographic and social isolation, under-education, racism, cultural change and stress..." (Postl *et al.* 1994:46).

Conclusion

Vitamin D deficiency might be an important issue in the north. There is insufficient evidence to be conclusive, but there is sufficient evidence to further support research to determine if vitamin D deficiency is widespread, and if increases lead to reductions in such conditions, as Baby-bottle Tooth Decay, with which the deficiency has been associated. This requires epidemiological investigations into the extent and magnitude of the problem, the risk factors for deficiency, and appropriate strategies for prevention. Improvement in Aboriginal health status also requires "an overall general improvement in the socioeconomic status of Aboriginal Canadians" (Waldram *et al.* 1995: 271), which requires political will.

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Lowbush Blueberry (Vaccinium myrtilloides *Michx.) Management in Northern Manitoba*

Jennifer Barker[1] and Norm Kenkel[2]

Lowbush blueberries (*Vaccinium* spp.) are a significant component of Manitoba's boreal vegetation. They are an important food source for wildlife, and are used by humans as a supplementary food source. Lowbush blueberries are commonly encountered in open forests and disturbed sites, and are most abundant on acidic soils. Natural stands occur along a number of Manitoba Hydro rights-of-way. Although blueberries are not currently an important cash crop in Manitoba, profitable managed stands are found in eastern Canada (the Maritimes, Quebec, and Ontario) and in the states of Michigan, Maine, Wisconsin and Minnesota.

While studies have investigated the cash crop potential of wild blueberries in eastern Canada, corresponding studies in the Canadian prairies are lacking. One localized study in northern Manitoba examined the potential marketing of the product in the form of jams and jellies (Bjornson and Ceplis 1991). Community interest was not strong enough to continue the endeavor. A six-year study conducted by the Saskatchewan Provincial Government in La Ronge examined various management and cultivation techniques for lowbush blueberry. Their results showed that management techniques appropriate for the prairies differ from those implemented in the Maritimes. Plants were most productive three seasons after pruning. The maximum yield was 682 kilograms per acre with an average of 364 kilograms per acre. Winter-kill and spring and August drought were found to lower productivity appreciably (Ivanochko 1988-1993).

Species Description (Vaccinium myrtilloides Michaux*)*

The mature plant is a deciduous, broad-leaf low shrub with ascending branches (average 21-49 cm in length). The stems are densely pubescent, dark brown or green. The leaves are entire, pubescent (6-16 mm wide and 20-32 mm long), simple, net-veined, elliptic or ovate-oblong, with an acute apex and an obtuse base (Figure 1). Two types of buds

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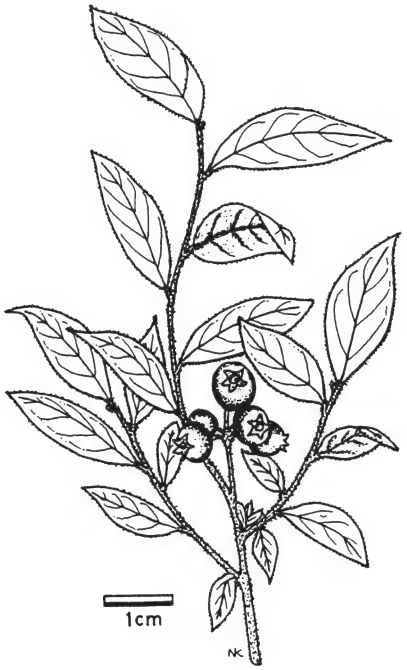

Figure 1.
Vaccinium myrtilloides *Michaux (Velvet-leaf blueberry). Habit during fruiting season.*

are formed; the larger flower buds are terminal, while the vegetative buds are proximally located on the stem. The underground rhizomes are woody and produce numerous shoots. New growth on the rhizome is usually white or pinkish. Shallow roots are fibrous and 0.1-0.5 mm in diameter. Taproots, which may or may not be present, have been found to depths of ca. 1 m (Hall 1957). The flowers are borne in lateral or terminal racemes. Each has five sepals, five petals fused into a bell-shaped corolla, 10 stamens in two whorls of five which are fused to the perianth, and an inferior ovary with a single pistil. The bluish-purple berry (6-8 mm in diameter) has a white bloom, and contains an average of 93 small seeds per berry of which ca. 16 are viable (Vander Kloet and Hall 1981, Vander Kloet 1988).

Habitat

In accordance with its wide geographical range (Labrador to British Columbia), *Vaccinium myrtilloides* has adapted to a wide range of climatic conditions: from a 60 to 200 day growing season, permafrost to temperate regions, and perhumid to subhumid climate types. Although the species is winter hardy, it experiences dieback if there is not adequate snow cover. Flowers are damaged by late spring frosts (when temperatures reach -1°C), and low temperatures are fatal to flowers at -10°C (Vander Kloet and Hall 1981). *V. myrtilloides* has variable responses to different light regimes. The plant is present in shaded areas under a forest canopy, but it will flower and fruit more readily in canopy openings (Vander Kloet and Hall 1981) and when not stressed by lack of water (Tirmenstien 1990).

V. myrtilloides is found on disturbed sites in the boreal forest (burns, clearcuts, abandoned farmland, rights-of-way), and in muskegs, bogs, barrens, headlands, outcrops of the Canadian Shield, and mountain meadows (Vander Kloet 1988). It reaches its greatest abundance in young post-disturbance communities, forming dense stands in serial stages 2 to 3 years after burning (Tirmenstein 1990). It thrives on a wide variety of acidic (pH 3.3 to 5.6), mineral and organic soils that are moist but well-drained. The plants reach high cover values on moderate to light, sandy soils (Tirmenstein 1990). The extensive rhizome system varies in depth, depending on the thickness of the organic horizon (i.e., the rhizomes are shallow if the organic layer is thick). This slow-growing, shrubby plant has low nutrient requirements relative to its herbaceous counterparts (Vander Kloet and Hall 1981).

Response and Adaptations to Fire

Northern boreal forests experience fire in intervals of ca. 50 to 100 years (Johnson *et al.* 1995). *V. myrtilloides* is abundant following natural forest fires, especially if the burns occur in the spring or late fall, before or after the storage of photosynthate (Tirmenstein 1990). Aboveground portions of the plant are killed, but underground rhizomes will survive depending on the severity of the fire, the depth of the rhizome, the growth stage of the rhizome, and the moisture level in the soil (Vander Kloet and Hall 1981). New growth will sprout from the rhizome if the fire is not too severe. The deeper the rhizome, the more it is protected from heat damage. The rhizomes are more susceptible to damage if they are in an active growing stage. If the soil is moist or frozen, more protection is offered to the rhizomes (Shoemaker 1978).

Recovery is more rapid in areas of thick soil cover (deep, protected rhizomes), with dramatic increases in biomass within the first two years following the fire. Overall plant vigor is increased, and flowering buds are usually more numerous on the new shoots. Berry production usually is at its maximum 10 to 20 years following a wild fire, i.e., before the forest canopy closes (Vander Kloet and Hall 1981). Burning is used as a management technique in order to increase productivity on commercial fields. In the Great Lakes region, a burning interval of 4 to 5 years has been suggested to maintain productivity of *V. myrtilloides* (Tirmenstein 1990).

Ethnobotany of the Lowbush Blueberry

Food

Lowbush blueberries (*V. angustifolium* and *V. myrtilloides*) were used and continue to be used by Aboriginal people throughout North America. Sometimes the dried blueberry was a trade item. Traditionally, the berry was eaten fresh, cooked in animal fat and stored, pounded into pemmican (a mixture of berries meat and fat, pounded into a paste and dried), dried in the sun and stored in birch bark baskets to be reconstituted upon boiling, stewed with a sweetener, baked into bread, or upon availability of trade goods such as sugar, made into jam (Kirk 1975).

In 1615, Samuel de Champlain noted that the native North Americans of Lake Huron picked lowbush blueberries and stored them for winter. Some other early journalists noted that the Aboriginal people also used 'fire-pruning' in Atlantic regions to stimulate the growth of blueberry patches, a management technique still in use today (Hancock and Draper 1989). In the Maritimes, wild blueberries became a commercial interest in the 1880s, and were harvested by settlers using hand rakes. The land that produced good

blueberries had very few nutrients, and was poor for farming. These areas had been cleared for farmland but were subsequently abandoned. With the building of the railway, there was an opportunity for the harvest to be exported to the United States. At this time, harvesting was a family business that brought in about five cents per pint. The industry became organized after the First World War, and in 1928, regulations were passed in Nova Scotia to encourage wild blueberry production.

The introduction of freezers in the mid-1930s changed the industry altogether. By the end of the 1930's, ca. 65% of the blueberries exported from Canada were frozen. Today, Nova Scotia and Quebec produce the largest lowbush blueberry harvest, followed closely by New Brunswick, Newfoundland and Prince Edward Island. The state of Maine produces 55% of the North American wild blueberry crop (New Brunswick, unpubl. doc.). Today they are widely cultivated and available frozen, fresh, and in syrups and jams. Wild blueberries are currently processed into baked goods, desserts, and dairy products like yogurt and ice cream.

Medicine

The Aboriginal people of North America have discovered the use of plants for food, medicine, and other purposes related to their survival. Every culture had their own framework of plant use, but there was a common ethic understood by all Aboriginal people. Specifically, there was and continues to be interdependence, and particularly a spiritual connection, between human beings and all living creatures.

Zieba (1990), Erichsen-Brown (1979) and Johnson *et al.* (1995) give accounts of the roots/rhizomes of lowbush blueberries being made into a tea and used for women's medicine. A handful of the green or dried root is boiled in enough water to make 1 cup of tea. Half of that is administered and more hot water is added to make 1 cup. This dose is repeated until the symptoms are gone. Women take this medicine up to two weeks before giving birth and following childbirth to prevent clotting. It is also used to prevent miscarriages, regulate menstruation, and relieve an inflamed uterus. One account noted the stems were prepared as a contraceptive. A journal in 1812 noted that this was the most effective and safe anti-spasmodic and that it was a great stimulant to the nervous system (Erichsen-Brown 1979). Johnson *et al.* (1995) also notes that the Chipewyan used this tea for headaches. Densmore (1974) learned that the Chipewyan used the dried flowers of the lowbush blueberry as a smudge in the sweat lodge, to cure "craziness".

Accounts in Erichsen-Brown (1979) state that the leaves are used in a decoction, as a diuretic, and as an astringent. This decoction is also used to purify the blood, to treat diarrhea and bowel disorders, to soothe a sore throat, to treat ulcers, bladder infections and incontinence, and to cure skin diseases such as eczema. Other accounts have stated that the decoction is also successful in controlling blood sugar levels in diabetic patients (Keene and Howarth 1995). A tincture called 'Myrtille' made from roots, berries, and gin has been used as a remedy for the aforementioned ailments as well. The dose is 10 to 30 drops every eight hours until the symptoms are gone. This tincture is derived from the common European species of lowbush blueberry, *V. myrtillus*. The berries of this species are recognized for their high level of anthocyanins, which have been found to be useful in intestinal action and diarrhea. The leaves of this plant are also useful in reducing blood sugar levels and to disinfect the kidney and bladder. Studies are currently being conducted in Kentville, Nova Scotia, to determine whether the antho-

cyanin compounds present in *V. myrtilloides* and *V. angustifolium* resemble those found in *V. myrtillus* (Argall 1995).

Management Techniaues

Crop Management

The stands of wild lowbush blueberries managed in Eastern Canada comprise mainly *V. angustifolium.* They are derived from native plants and are considered to be wild stands. They require management to maintain a high cover and to create a stable shrub community. This practice is termed "arresting succession" (Niering and Goodwin 1974); the area is disturbed regularly to mimic natural disturbances that stimulate vegetative and reproductive growth. Ecological dominance of the blueberry is maintained by regular pruning and the use of selective herbicides (Eaton 1994). In agricultural management operations involving lowbush blueberry, pests and pathogens (weeds, insects, and fungi) are undesirable components of the fields. Several methods are employed to combat these deterrents to maximize productivity of the blueberry plants: i.e., herbicides, pesticides and fungicides (Blatt *et al.* 1989).

Pruning

Pruning native stands of lowbush blueberry is necessary to mimic natural disturbances, and to produce a continually high-yielding crop. Pruning replaces the older, highly branched, less productive shoots with new ones that regenerate from the rhizomes or basal stems. Spring or autumn pruning will increase vegetative branching and stimulate reproductive bud formation the following growing season. The fruit will not be produced until the year following pruning. Pruning is also a non-chemical method of weed control, because some vegetation is not well adapted to frequent disturbances. Burning and flail mowing are the most common pruning practices administered in crop management. Once the blueberry field is developed, half of the field is harvested while the other half is pruned. These cycles alternate so that half the field is harvested each year (Sibley 1994). Burning a field every five to six years has been recommended by S.P.Vander Kloet (Acadia University) for *V. myrtilloides* in northern Manitoba, although further study must be conducted to confirm whether this is an appropriate cycle.

Irrigation

In the Maritimes, precipitation provides sufficient moisture for successful fruit development. In areas limited by moisture and humidity, irrigation is a common practice. Soil moisture is needed to ensure proper flower bud development in the growth year, and to increase berry weight in the harvest year (Hepler and Yarborough 1991). In areas of adequate moisture and humidity (such as Atlantic Canada), irrigation is generally not necessary. Irrigation is an added expense that must significantly increase yield to be worth the time, effort and cost. Lowbush blueberry cultivation and harvesting has been considered in the prairie provinces (Manitoba and Saskatchewan), but a limiting factor common to both studies was the need for adequate soil moisture (Hoefs and Shay 1981, Ivanochko 1993b). In drier areas like Minnesota, an irrigation schedule of 2.5 cm per week is suggested. Where an adequate water source is unavailable, mulching with sawdust may retain moisture in the soil and suppress the growth of competing vegetation. In most cases, mulching will not increase flower bud formation or stem growth of pruned plants (Tirmenstein 1990).

Fertilization

Fertilization is commonly practiced in agricultural operations in order to increase the vegetative growth of the plants, especially in areas of particularly low fertility. Ammonium fertilizer is commonly used in association with herbicides because competing vegetation also responds vigorously to fertilizer applications (Blatt *et al.* 1989). There are several factors to consider in determining whether fertilization of a blueberry field is required. Since lowbush blueberries occur on acidic soils, the available form of inorganic nitrogen (N) is ammonium. Nitrogen addition contributes mostly to vegetative growth, not flower bud formation (Eaton and Patriquin 1988). The nitrogen, once assimilated, is translocated to the fruit during development.

The blueberry plants respond better to the ammonium form of nitrogen, but so do potential competitors. A nitrogen supplement is most effective if administered to fields having very low soil fertility. There is little to no response to N fertilizers if ambient levels are adequate (Blatt 1983). Under moderate fertility, the growth of competing vegetation is stimulated (Blatt *et al.* 1989, Eaton and Patriquin 1988). Under high levels of nutrient addition, the mycorrhizal association with the roots (a symbiotic relationship that aids the plant in nutrient uptake) is not necessary, putting the mycorrhizal fungus into dormancy. Therefore, fertilizer must only be applied in small quantities in areas of very low fertility, to ensure the persistence of the mycorrhizal association and to prevent the invasion of competing vegetation (Hepler and Ismail 1985). Another drawback to using fertilizers is that increased vegetative growth may result in winter injury if the plant height exceeds the snow cover. Snow cover would normally provide insulation to the underlying plants throughout the cold winters (Wildung and Sargent 1986).

Prospects for the Prairies

Although *V. myrtilloides* occurs in the prairie provinces, few studies have been conducted regarding its economic potential. Hoefs and Shay (1981) examined the effects of shade on the shoot growth of *V. angustifolium* in southeastern Manitoba, in order to determine optimum light conditions for blueberry growth. The dry climate of Manitoba was thought to be the limiting growth factor for the commercial production of lowbush blueberries.

A feasibility study was conducted by Ivanochko (1986-1993) in La Ronge, Saskatchewan, in order to determine the best management technique for *V. myrtilloides*. A variety of methods were used, including those commonly used in eastern Canada. The results of the study showed that productivity was not high enough to offset management costs. The plants were susceptible to late spring frosts, spring or late summer drought, winter kill, and competition from associated vegetation. The final recommendations were to consider irrigation or shading, the introduction of *V. angustifolium*, or harvesting a late crop of *V. vitis-idaea* (lingonberry). To date, agricultural production of *V. myrtilloides* has not been pursued in this area.

Bjornson and Ceplis (1991) recently conducted a developmental study in northern Manitoba on marketing the wild berries picked by native communities. The remoteness of the communities created a problem in transporting the fresh product to market. There was also a problem in keeping individuals committed to organizing, harvesting, processing, and marketing the final product. The market potential for wild berries in this area is great. Individuals with enthusiasm and training are required to build the necessary routes for successful product marketing.

The present Thompson-Nelson House study is similar to that of Ivanochko (1986-1993). The information from this study will be used to determine the requirements for *V. myrtilloides*, provide the potential for commercial production of blueberries on the hydro-line rights-of way, stimulate the local economy, and make efficient use of the cleared land provided by the rights-of-way. To date, berry picking is done for personal consumption.

Study Area

The study area, shown in Figure 2, has been described by Zoladeski *et al.* (1995) as northern coniferous forest located on the Canadian Boreal Shield. The boreal shield stretches across central and southeastern Manitoba and comprises undulating uplands and lowlands. Precambrian granitic bedrock outcrops, moraines, glaciofluvial and colluvial deposits make up the surficial geology.

The continental climate of this ecozone is noted for its short warm summers and cold snowy winters. The Thompson area (55°48'N, 97°52'W) has a mean annual temperature of -3.3°C and the normal total annual precipitation is ca. 536 mm (Figure 3). There is ca. 126 frost free days between May and September, and six months

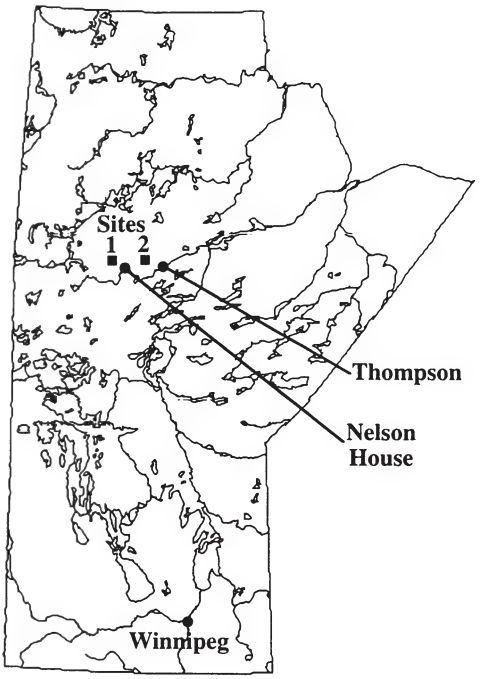

Figure 2.
Location of study area, including site locations in relation to Thompson and Nelson House.

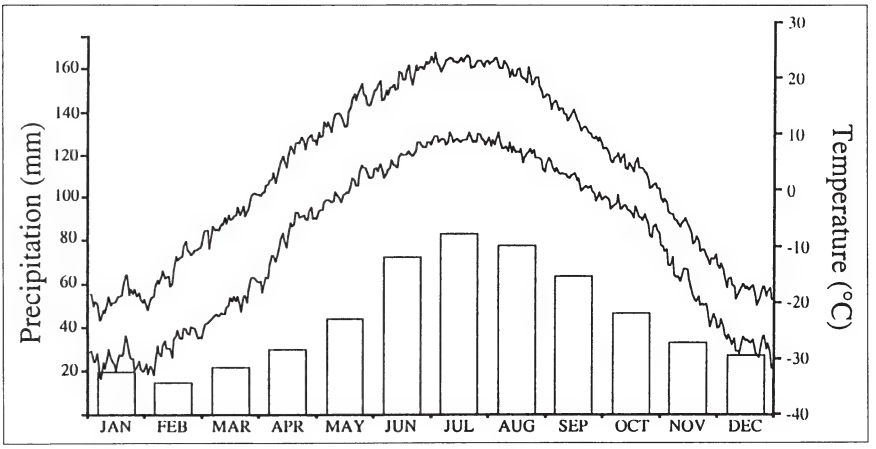

Figure 3. *Long-term normal maximum/minimum temperatures (lines) and precipitation values (bars) for the Thompson region (Environment Canada, Climate Services).*

(November to April) of the year have mean daily temperatures below zero degrees Celsius (Zoladeski *et al.* 1995).

The soils that dominate this area are luvisols, brunisols, organic and discontinuous organic cryosols. Soils that dominate areas with high *V.myrtilloides* cover are classified as discontinuous organic mats on bedrock, extremely shallow soil on bedrock, or shallow-moderately deep/sandy soil (Zoladeski *et al.* 1995).

The boreal forests of Manitoba are influenced by various natural disturbances, the primary one being natural forest fires. On average, fires will burn areas every 50 to 100 years, influencing the growth and distribution of the forest stands (Johnson *et al.* 1995). Therefore, the boreal forest mostly is composed of even-aged stands of pioneer species established following fires. Several of the boreal tree species have adapted to surviving this natural disturbance. Coniferous species store their seeds in cones which open during a forest fire, while aspen species and ericaceous shrubs survive by means of the preservation of their underground parts. Several understory species maintain a viable seed bank (Johnson *et al.* 1995).

Materials and Methods

Community Co-operation

Methods have been investigated for initiating scientific studies in communities that do not traditionally value research in scientific fields (e.g., Ward 1996). The goal of community co-operation is to gain approval for the study by opening a line of communication between members of the community and the researcher. The desired approach is contrary to the conventional one of undertaking a study without first advising the leaders of the community. The latter approach tends to be invasive and insulting, and can result in negative feedback and a subsequent lack of co-operation by community members.

For this study, letters of introduction were sent to the northern communities, followed by telephone calls. Community leaders were advised of our wish to investigate the growth of blueberries along the Manitoba Hydro line rights-of-way, which provided them an opportunity to discourage or welcome the survey in their area. Nelson House First Nation responded positively to the study and plans were made to conduct the study in that region. The community benefitted directly from the study and from employment of summer students. In addition, individuals from the community were invited to share their knowledge about the berries that grew in the area.

Study sites were selected on accessibility to rights-of-way (since most of the lines in northern Manitoba are only accessible by helicopter, snowmobile, or ATV), an adequate cover of *V. myrtilloides* (at least 30%), and close proximity to a First Nations community that had given their support for the project. It was also desirable to find sites that were representative of the different habitat types (i.e., rocky outcrops and well-drained sandy sites dominated by jack pine). Two sites were selected.

SITE 1: 55°50'N, 99°01'W. This site is located between poles 219 and 220 on the Thompson-Notigi hydro-line right-of-way. It is located on a xeric, rocky outcrop of the Canadian shield, dominated by jack-pine and black spruce. The site is situated on an east-facing slope, with discontinuous organic mat on bedrock. This site type is classified as Jack Pine-Black Spruce/Lichen by Zoladeski *et al.* (1995). The presence of lichen and scattered dried wood on the forest floor indicates it is susceptible to frequent burns. The soil organic layer is usually no more than 5 cm thick. The moisture level ranges from dry (on exposed rock) to moist (in pockets created by the exposed bedrock). The area is relatively well drained due to its sloping nature.

SITE 2: 55°50'N, 98°16'W. This site is located between poles 90 and 91 on the Thompson-Notigi hydro-line right-of-way. This area is situated on a glacio-fluvial deposit (lateral moraine and kame) and experienced a forest fire in the mid-1960's (Veldhuis 1995). It is well-drained and dominated by regenerating jack pine. The flat topography and the open right-of-way make this area subject to high exposure by wind and sun. This site type resembled the classification of Jack Pine/Feather Moss outlined by Zoladeski *et al.* (1995). The soils are shallow-moderately deep/sandy and the organic layer is 6 to 15 cm thick above the sand layer. The soil moisture level ranges from dry to moist since it drains rapidly and is highly exposed to sun and wind.

Experimental Design

Plot Design

At Site 1, 16 experimental plots were established for management trials. At Site 2, 20 plots were marked. A typical experimental plot is outlined in Figure 4. Seven management treatments used successfully in eastern Canada, and feasible for northern Manitoba, were implemented.

Management Treatments (Abbreviations for the management techniques, given in parentheses, are the designations for treatments that are used on the box-plot figures in the ***Results*** section.)

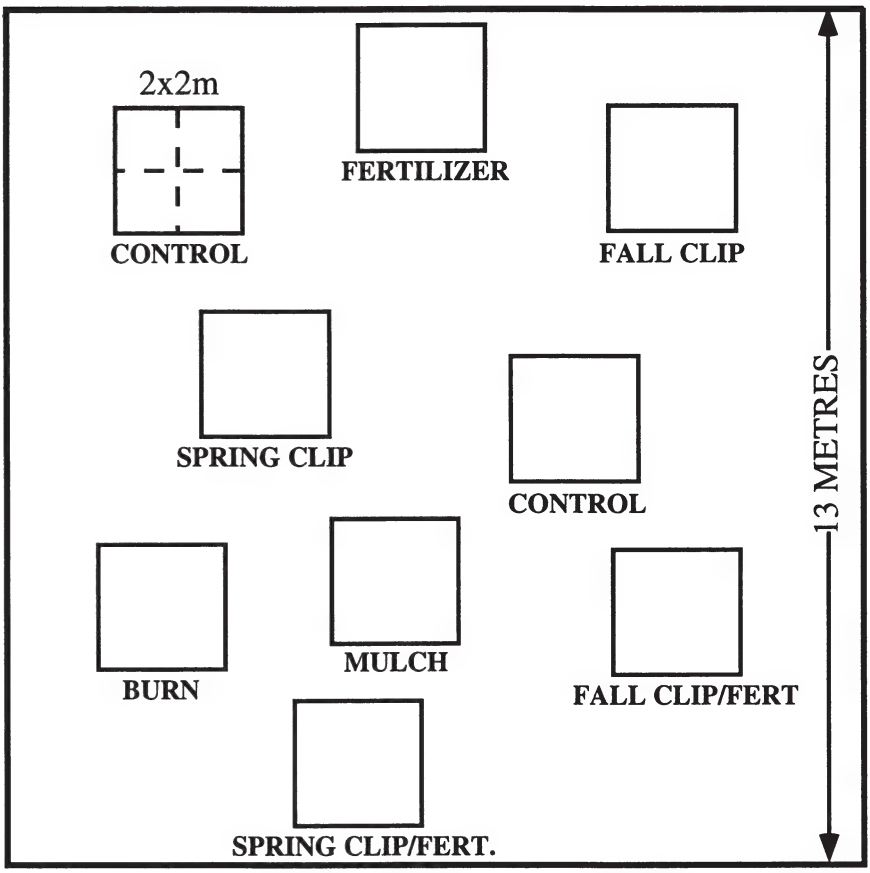

Figure 4. *An example of an experimental plot with randomly assigned treatments. The treatment plots were placed where there was blueberry cover. Two 1m^2 sample plots were randomly selected from each treatment plot for data collection purposes.*

1. Fertilization (FERTI) may be beneficial in increasing vegetative growth and expanding the clone of lowbush blueberries, thereby out-competing other vegetation. It may also stimulate the production of flowering buds, potentially increasing fruit productivity in the following season. A fertilizer mix of 17-17-17 (N-P-K), slow-release fertilizer was suggested by L. Eaton of Nova Scotia, at a rate of 120g per treatment plot (4m^2). Border Chemicals of Winnipeg donated the product. Fertilizer was applied to all plots on May 29, 1996.
2. Clipping of vegetation in the fall (FALCL) may serve to stimulate branching of blueberry plants in the spring, allowing them to out-compete other vegetation early in the season. This management technique may also stimulate the growth of competing grass species. The vegetation was clipped using hedge trimmers following berry harvest, between August 15-19, 1995.

3. Clipping of vegetation in the spring (SP.CL) stimulates branching in that season, and allows blueberries to out-compete other vegetation that does not tolerate pruning. The spring clip was conducted using hedge trimmers, on May 29, 1996.
4. Applying sawdust mulch (MULCH) to the plots may increase soil moisture by preventing soil moisture loss. After the flowers are fertilized, mulching may also increase the biomass of the fruit and prevent fruit desiccation in the event of a late summer drought. Coniferous sawdust mulch was collected from Norwest Industries in Thompson, and placed it in large garbage bags to equal approximately 100 litres of sawdust. This converts to a thickness of 2.5 cm for each 2m by 2m plot. I applied the mulch on May 30-31, 1996.
5. Burning (BURN), a common practice in eastern Canada, burning mimics the natural disturbance of forest fires. Burning in the spring, while there is still snow in the adjacent forest, will stimulate branching of lowbush blueberry plants and stimulate fruit production in subsequent years. Burning releases nutrients present in the plants and litter, making the nutrients available for the plants to use. However, intensive burning (every two years, for several years) will destroy the organic matter and nutrients of the soil. The burn was conducted using a hand-held Tiger torch attached to a 20 pound tank of propane and a 35 psi regulator. Efforts were made to ensure that the pressure was kept constant for all of the burn treatments and the torch was the same distance from the ground, so that the intensity of the burning was identical for all areas. The burn at site 1 was conducted on May 23, 1996. The propane tank was operating at about 10°C and the pressure was maintained at about 5 psi. The torch was held about 6 inches away from the ground. Burning was conducted in the morning or evening with a calm wind. Each plot was allowed to burn for one minute before the fire was extinguished.

   Site 2 was burned in the evening of 27 May, 1996. Waxes were used to determine the burn temperature. Waxes of six different melting points were wrapped in foil and placed on the plot during the burn, to approximate the temperature of the burn. The burn temperature was estimated to be between 107°C and 163°C. The tank temperature was about 18 - 20°C, and the regulator gauge was maintained at 5 psi.
6. Clipping in the fall and adding fertilizer (FAFER) the following spring and summer may mimic the effects of burning, if burning is not feasible for the area. The plots were clipped following harvest in 1995 and fertilizer applied at the end of May 1996.
7. Clipping in the early spring and fertilizer addition (SP.FE) may also mimic the effects of burning. The fall and spring clips were conducted to determine if there was a difference between clipping times, and if so, which time gave better results
8. Control (CONTR) plots were established; results from the management trials (treated plots) and control plots were compared to determine the effectiveness of the treatments.

Productivity Data Collection and Analysis

Productivity and associated vegetation data were recorded for the 1995 season. This information was used to determine responses to management techniques for each plot in the 1996 treatment year.

I sampled two $1m^2$ sections in each treatment plot. Productivity of the blueberry plants was measured by counting the number of stems rising from ground level, harvesting the fruits (grams), counting the number of flowering buds that produced berries, and estimating percent cover values. The percent cover of the other types of vegetation in the plot was estimated as well, in order to determine their response to treatment.

Productivity values were recorded in the baseline year (1995) and following the application of the treatments (1996). Means for each treatment plot were calculated for the 1995 and 1996 data. First order differences between these means ($Mean_{1996}$ - $Mean_{1995}$) determined the response to treatment (i.e., a decline in stem counts corresponds to a negative response). This data set was ranked and a Kruskel-Wallis analysis of variance of ranks test used to determine if there were significant differences between the treatment groups. The test statistic was compared to a Chi-squared distribution with df(n-1)=7 at alpha=0.05. A ranked test was used because there were negative responses and the data was not normally distributed. To determine the differences between groups, boxplots were generated to detect the significantly different treatment groups. The outlined central box shows the middle half of the data, between the 25th and 75th percentiles. The horizontal line within the box is the median value. The 'whiskers' above and below the box represent the extent of the main body of the data. Extreme outliers are plotted with a circle and very extreme outliers are plotted with an asterisk. The distribution data for each treatment plot was compared to the distribution data of the control plots to detect which treatments were most effective.

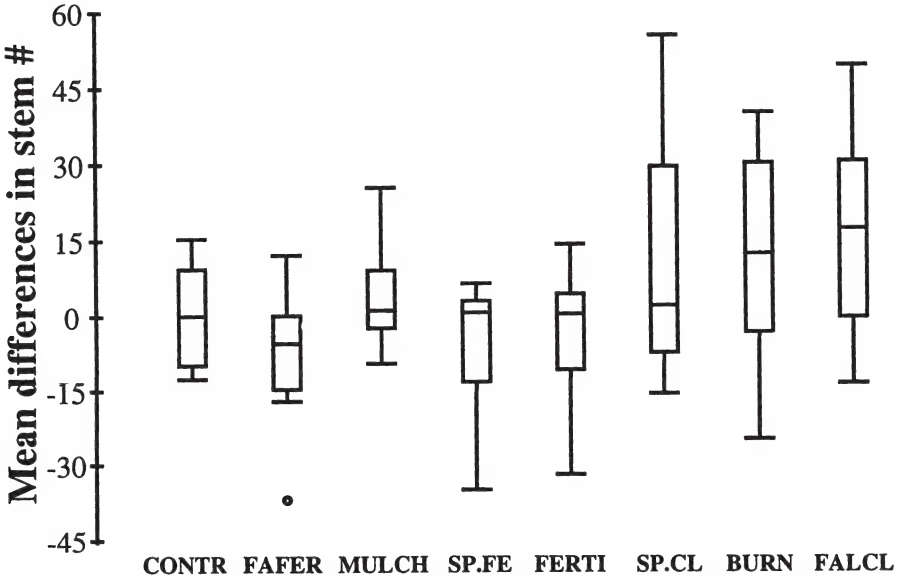

Figure 5. *Boxplots showing the mean differences in blueberry stem numbers between the baseline year (1995) and treatment year (1996) for Site 1 (rocky). The last two treatments show a significant difference from the control.*

Since berry production and flowering buds could not be analyzed for all the treatments (pruned plants do not produce buds or fruit until the following growing season), stem numbers and cover values were used to determine differences in response to treatment.

Results and Discussion

Site 1 (rocky): The Kruskel-Wallis non-parametric test showed significant differences in stem numbers between groups of treatments (c^2=23.033, p<0.001). In particular, the medians for the burn treatments and the fall clipped treatments were higher than the remaining treatments and the control plots (Figure 5). This demonstrates that the burn treatments were successful at stimulating vegetative growth from the underground rhizome buds. The fall clipped treatments were even more successful at stimulating new shoot growth. The new growth usually rises from the remaining aboveground stem buds (as opposed to underground rhizome buds in burned plots) because apical dominance is destroyed (Vander Kloet and Hall 1981). The statistical test for cover values of blueberry at this site showed a significant difference between groups of treatments (c^2=14.574, p=0.04). The boxplots indicate that the increase in cover occurred with the fall clipping, fall clipping with fertilizer and the burn treatments (Figure 6).

Site 2 (sandy): The non-parametric test showed no significant differences in stem numbers between groups of treatments for this site (c^2=5.4558, p=0.6). The medians in the boxplots show no difference between the treatments and the control (Figure 7). There was high variability in this data which made it difficult to detect definitive

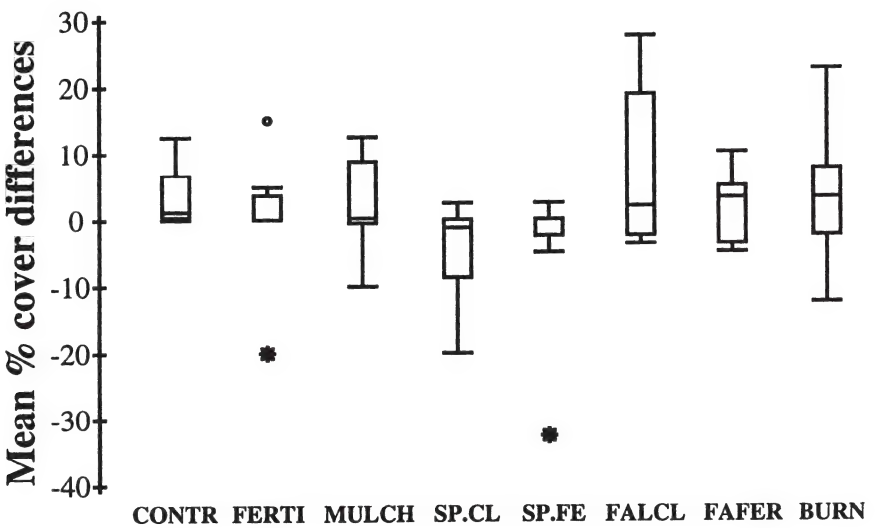

Figure 6. *Boxplots showing the mean differences in blueberry cover values between the baseline year (1995) and treatment year (1996) for Site 1 (rocky). The last three treatments differ from the control.*

responses. There were, however, statistically significant differences in cover values for this site (c^2=19.05, p=0.008). The boxplots show that fall clipping seemed to result in a loss of cover, while fertilization and spring clipping with fertilizer resulted in an increase in cover values (Figure 8). The blueberry plants at site 2 experience competition and lack soil moisture, but they are not limited by space. Most of the plants' energy seems to be allocated to vegetative reproduction (rhizomes), not fruit production. Since the stand has not been disturbed in over 30 years, the clones show signs of aging (many old stems and few young stems). *V. myrtilloides* is a disturbance-adapted species, and requires frequent disturbances in order to remain viable. Burning creates a black ground surface, thereby decreasing the albedo and resulting in water loss due to evaporation. Some plants that were burn-pruned did not produce stems from rhizome buds, due to lack of moisture. The spring clipping would not decrease the albedo but would promote branching from the aboveground stem buds without the stress of water loss. The *Carex* spp. (sedges) were the only associated species that showed any response to treatment. There was no difference from the control plots in response to burning, but there was a positive response in all treatments except for fall clipping and mulching.

Conclusions

Wild blueberries prefer habitats of low nutrient availability and acidic soils. *V. myrtilloides* thrives as a pioneer species in disturbed habitats of northern Manitoba, where fire or clearing has occurred. Arresting succession with management techniques results

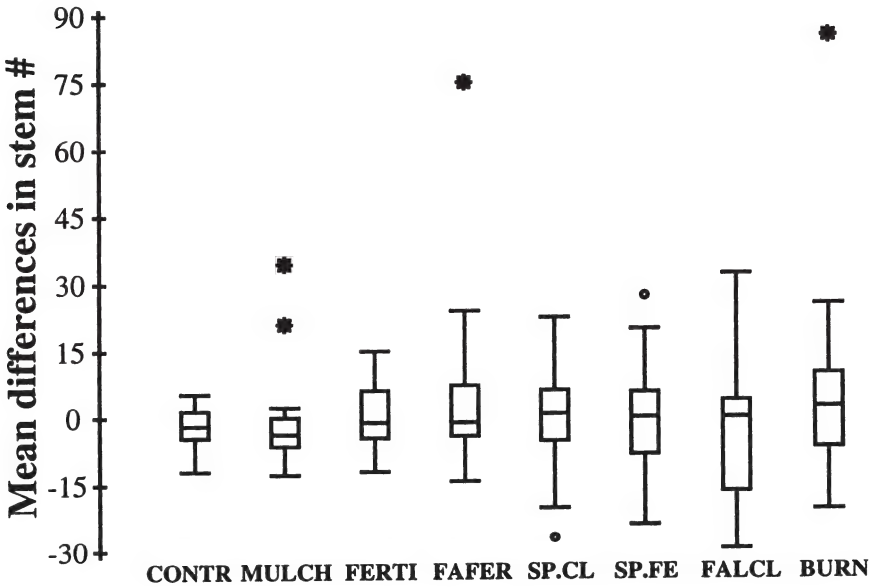

Figure 7. *Boxplots showing the mean differences in blueberry stem numbers between the baseline year (1995) and treatment year (1996) for Site 2 (sandy). Threre are no significant differences between any of the groups.*

in increased productivity for lowbush blueberry (Eaton 1995). More research must be conducted to determine an appropriate burn cycle for northern Manitoba.

"Pruning", in the form of spring burns and fall clipping, increases the vegetative growth of lowbush blueberry on rocky xeric outcrops. Stem numbers significantly increased in the burning and fall clipping treatments. An increase in stem numbers can be directly related to an increase in berry production for seasons following a prune treatment because younger shoots tend to have more reproductive potential. Cover values increased for fall clipping, fall clipping with fertilizer, and burning treatments for the rocky site. Cover may increase in the following growing seasons as well.

Treatments conducted on the sandy site exhibited highly variable responses in stem numbers, although cover values increased with fertilizer application and spring clipping with fertilizer. High blueberry productivity was observed in the fall of 1996. Lowbush blueberries on this sandy site in northern Manitoba have remained productive for at least twelve years following the forest fire. There may be other confounding factors that resulted in the variable responses to treatment such as high exposure to wind and sun resulting in moisture loss, and the age of the stands.

Adequate moisture and nutrient levels, competitive advantage and aspect of the site were responsible for the successful treatments on the rocky site. Plants on this site occur in a patchy distribution, dominating pockets that occur in the bedrock. Hoefs and Shay (1981) demonstrated that burn treatments would eliminate the patchiness apparent in natural stands of lowbush blueberry.

Personal communications with individuals at Nelson House First Nation revealed an interest in utilizing Treaty Land Entitlements (TLE) for economic purposes, specifically in the harvesting of non-timber forest products and for tourism. Current uses of

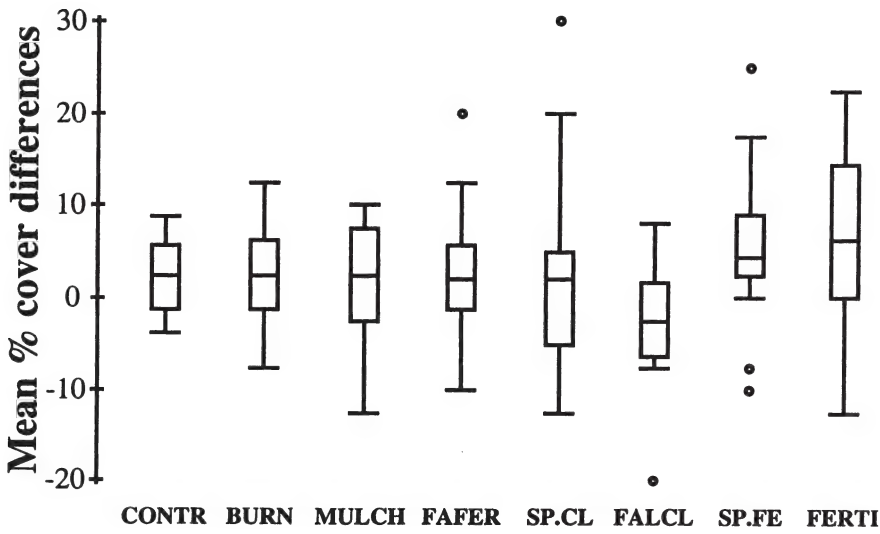

Figure 8. *Boxplots showing the mean differences in blueberry cover values between the baseline year (1995) and treatment year (1996) for Site 2 (sandy). The last three treatments differ from the control.*

TLE include hunting, dog sledding, fishing, medicine collecting, camping, and berry collecting. To date, berries are only collected for personal consumption, or they are sold to the Development Corporation for distribution to the elders and the ailing members of the community.

Recommendations

1) A long-term study is necessary to examine the temporal response of treatments on this long-lived, slow-growing shrub. A larger scale study would be beneficial in order to provide more evidence of the responses of wild blueberry stands to management treatments. If larger treatment areas and sample plots are used, the study would be useful in determining the response of tree species in the sapling stage, such as *Alnus*, *Populus,* and *Salix*, which pose a potential threat to the safety of the hydro-electric lines. These species may also prove to be competitors to the lowbush blueberry.
2) It would also be useful to conduct a survey of all the recently burned and logged areas in northern Manitoba for wild blueberry cover and production. Accessible areas should be examined for harvest potential, including Manitoba Hydro rights-of-way.
3) Wild blueberry productivity and cover in areas that are in various stages of recovery from disturbances such as fire or timber harvesting should be monitored, and management trials should be conducted at these different site types (e.g., logged areas and recently burned areas).
4) A survey should be conducted of the market potential for wild blueberry harvesting in Manitoba, with the support of related or similar industries, since such an enterprise would encourage the harvesting and selling of other non-timber forest products. This marketing enterprise would give First Nations communities an opportunity to apply their Treaty Land Entitlements to economic development endeavours.

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An Ethnographic Study Exploring First Nations Peoples' Perceptions and Experiences With Cancer

Fjola Hart-Wasekeesikaw[1]

Background to the Study

First Nations People have recently become concerned about the rising incidence of cancer in their communities. It is difficult to obtain statistical profiles for Aboriginal groups because there is no national Aboriginal cancer registry. Our knowledge and understanding about cancer in First Nations People is largely epidemiological in nature. This statistical understanding is according to specific cancer sites and geographical regions in Canada and the United States. With the exception of two studies, Sprott (1988) and Weiner (1993), the contemporary First Nations Peoples' explanation of cancer is absent. The emotional, social, cultural, and spiritual aspects of the cancer experience among First Nations People is also lacking.

Study's Purpose and Research Questions

The purpose of this study was to explore and describe the experiences of First Nations People diagnosed with cancer, and elders' perceptions of cancer. The research questions were: What beliefs do First Nations People have about the origins and pathophysiology of cancer? What experiences have First Nations People had with cancer treatment? What is the experience of cancer for family members? What perceptions and beliefs do community members hold about cancer?

Conceptual Framework

The Medicine Wheel is the conceptual framework for this study. It is an ancient and powerful tool used by some Indigenous nations to guide their learning and healing pathways to attain and maintain health. The Medicine Wheel reflects the philosophy of traditional Aboriginal health and sickness. The traditional Aboriginal view of health

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and sickness, and the "traditional healer" are defined. Then the Medicine Wheel is presented.

Health and Sickness

Traditional Aboriginal views of attaining and maintaining health and the occurrence of sickness are dynamic, inter-related, inter-dependent, multidimensional and holistic processes (Bopp *et al.* 1989, Garrett 1991, Malloch 1989). Health is the interaction between the physical, mental, emotional and spiritual realms which constitute a person, a family and a community (Bopp *et al.* 1989, Garrett 1991). When the interdependent relationship of these realms is disrupted, a person will develop sickness (Hamilton and Sinclair 1991).

Traditional Healer

A traditional healer or medicine person possesses knowledge and abilities to heal through spiritual ceremonies and herbal medicines. The gift of healing is the power of the Creator. The healer is concerned with the person's body, mind and spirit and the connectedness this person has with the natural and spirit worlds. The traditional healer serves as a channel through which healing powers flow from the Creator to the one who is sick. The healer is accountable to the Creator and to the people, and is governed by the natural laws of the Universe (Malloch 1989).

The Medicine Wheel

Composed of inter-relating concentric circles and the four directions (east, south, west, and north), the Medicine Wheel symbolizes all that provides meaning to the human experience (Bopp *et al.* 1989). It is an effective guide for this research project. The universal, dynamic, inter-related and multi-dimensional nature of the Medicine Wheel accommodated a wide range of experiences, beliefs, and perceptions First Nations People have about cancer, its origin and disease process, treatment and healing practices, and role of the traditional healer. It afforded the analysis of data from the perspectives of those diagnosed with cancer, and community members. Family members' beliefs about the origin of cancer were also obtained.

The impact of pollution, a carcinogenic threat to the lifegiving forces (earth, air, water, and fire) shown in Figure 1, contributed to understanding the causes of cancer in First Nations communities (Bopp *et al.* 1989). The range of beliefs First Nations People have about the diagnosis and treatment of cancer is accommodated by the colours red, yellow, blue/black, and white, in various directions of the Medicine Wheel (see Figure 1). For example, the colours blue or black symbolize Indian medicine and spirituality.

The life cycle of people symbolically correlates with the seasonal cycle on the Medicine Wheel (Bopp *et al.* 1989). They are delineated by the directions on the Medicine Wheel (see Figure 2). These cycles begin in the east — marking birth and spring. The life cycle also accommodates the role of each informant within the family and community. Of particular significance to this study is the relationship between the elders and those diagnosed with cancer in the community. Because of the way they have travelled through their life cycles, elders have knowledge and experience about the origins and pathophysiology of cancer.

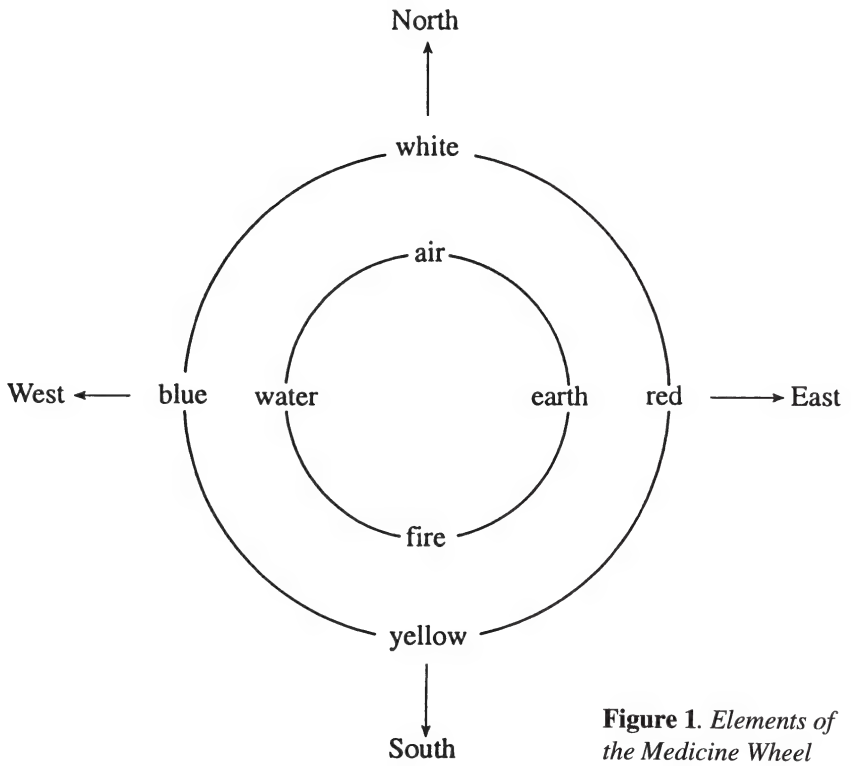

Figure 1. *Elements of the Medicine Wheel*

The Medicine Wheel accommodates the cancer experience between the individual diagnosed with cancer and his/her family and community. The individual, family, and community are represented in a set of concentric circles as shown in Figure 3. The spiritual, emotional, physical and mental aspects of the person, family, and community, shown in Figure 4, are integral to the Medicine Wheel (Bopp *et al.* 1989). A person's experience with cancer affects her or him spiritually, emotionally, physically, and mentally. Similarly, when a family member has cancer, the entire family is also affected spiritually, emotionally, physically, and mentally. This is also a consideration for a community when its members have cancer.

The knowledge obtained about cancer from each direction is the interplay (analysis) of the date that the informants provide at each concentric circle and direction. For example, what does the community say about the roles of Indian medicine and western medicine in treating cancer?

Family members' perspectives about their relatives' experiences with cancer at varying stages of the disease were not explored due to the limited number of participants.

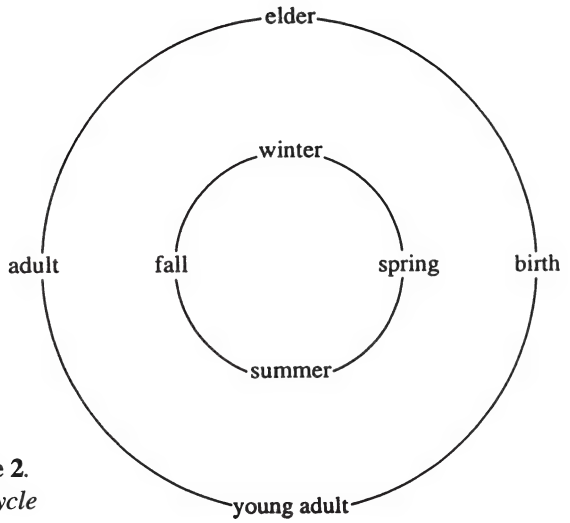

Figure 2.
Life cycle = seasonal cycle

Literature Review

Sprott (1988) and Weiner (1993) were the only two studies conducted with the purpose of obtaining Aboriginal peoples' understanding about the causes of cancer. However, serious limitations in Sprott's research design hindered a greater understanding about Alaskan Aboriginal perspectives about cancer etiology. Cancer beliefs among Luiseno Indian People and Alaskan Aboriginal peoples (Sprott 1988) provide some understanding about the causes of cancer from an Aboriginal perspective. It is believed that food, water, air, and soil contaminated by modernization and/or development cause cancer.

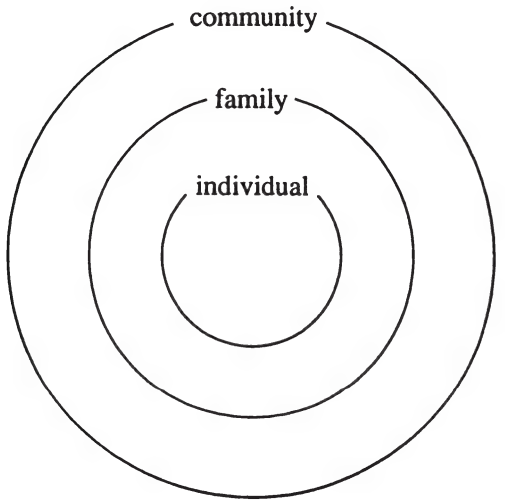

Figure 3. *Individual, family, and community in the Medicine Wheel*

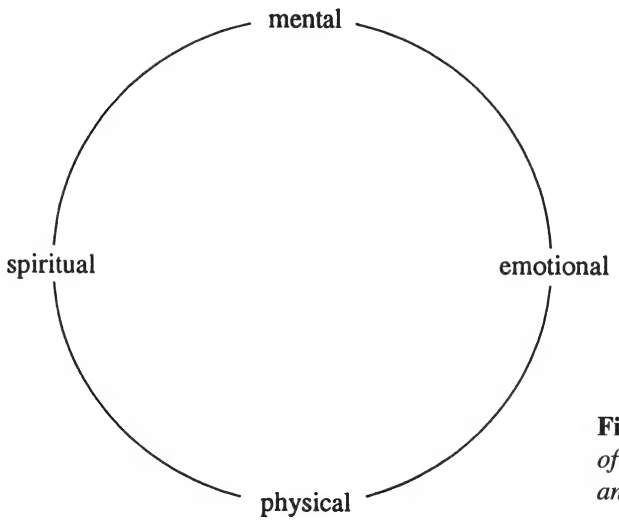

Figure 4. *Aspects of the individual, family, and community*

Methodology

This was an exploratory, descriptive ethnographic study. Four different Anishinaabe communities in Manitoba participated in this study. Before inviting their participation, I obtained ethical approval from the Nursing Ethical Review Committee at the University of Manitoba. I used Guba and Lincoln's (1989) criteria for establishing trustworthiness. My fieldwork included recording interviews with informants using semi-structured interview schedules. I also recorded the observations I made during the interviews and during my tours in the communities. The transcripts of 46 informants in four Anishinaabe communities were analysed using three data sets: the individual with cancer, his/her family, and the community. Within these data sets, ten informants were diagnosed with cancer, nine were family members, and 27 were community members.

Findings

The cancer experience among First Nations People was metaphorically characterized by "the stranger". I selected "the stranger" after an informant spoke about the effect of cancer on her family. Three of her five brothers and sisters had cancer. The informant considered her family's experience with cancer as being "strange" because every second sibling had the disease. This metaphor also reflected how European missionaries, hunters and trappers were received by the Anishinaabe in their communities long ago. Uncertain as to the purpose of the intruders, Anishinaabe elders spoke about how these strangers were looked upon with both curiosity and suspicion. Since Anishinaabe communities were well contained, the people were alerted to any newcomers and watched the strangers' movements closely. Because it is new and unfamiliar, as were the first European visitors to their communities, cancer is strange to the First Nations People in this study.

The following are some examples of the cancer experience themes that I used to categorize information from interviews. In the theme titled "The Presence of a Stranger: The Elders Speak", the elders provided an historical perspective of the development and prevention of cancer in First Nations communities. In the theme titled "Making The Stranger Known: The Healing Journey", the informants identified traditional Indian medicine as one way to manage cancer in their communities. Other themes included beliefs about cancer causation, cancer metaphor, metaphor for understanding cancer, the cancer experience, and the community experience.

Cancer Causation

Informants believe that "progress", a form of modernization, has contributed to an increase in the frequency of cancer in their communities: in particular, chemicals, environmental pollution, pesticides, and food additives affect their food products, wildlife, and water supply. The predominant cause of cancer is believed to be processed food including junk food, domestic meat, canned foods and foods thick with additives and other chemicals. Smoking cigarettes is the second most commonly identified cause of cancer. Other perceived causes included infection, injury, cancer as a contagion and "bad medicine".

Cancer Metaphor

A range of metaphors reflected First Nations Peoples' understanding about cancer. The most common metaphor used by the Anishinaabe in all four communities was "*manitoch*" which, in the Ojibwa language, Saulteaux, means cancer-as-worm. Reflecting their understanding about the disease process and treatment outcomes of cancer, the cancer metaphor means pain and death. *Manitoch* grows and breeds by consuming flesh and bone of its hosts. It is manifested by pain and other signs of decay and devastation. Its incurable nature is depicted by its tentacle like projections which are impossible to surgically remove.

The Cancer Experience

Ten informants with cancer participated in this study, eight women and two men. Of the women, three were diagnosed with breast cancer, two with uterine cancer, and one each with acute leukemia, kidney cancer and colon cancer. One man had lung cancer and the other had prostate cancer. All the informants were in the process of receiving treatment or had completed treatment.

Five major themes emerged for the cancer experience. These themes describe the informants' experiences with the awareness of having cancer, leaving their communities to have their cancers confirmed and treated, facing their own mortality and dealing with their ever present fear that their cancers will return, facing the silence that surrounds the person with cancer, and the need for spiritual strength and guidance as part of their living with cancer. I will briefly present one of these themes.

In the first theme, "Becoming Aware: The Stranger in the Body", the informants sensed they had cancer when they noticed marked physical changes in their bodies. Immobilized by fear, they did not seek help from a health professional right away. The following excerpt from "Sylvia's Awareness" conveys her fear about having breast cancer.

> I found the lump myself. . . . I was scared at first when I noticed the lump...I kept a close watch on it and I thought it would go away but it stayed there. And I don't know, I don't know. I didn't know what to think, I got scared right away and I didn't know who to talk to. I talked to my sister, the first one that had it. . . . She had her breast removed and she talked to me about it. And I got scared. And she said, "Don't be scared." She said, "Maybe it'll go away." And I said, "I don't think it'll go away." And then she asked me if I was afraid to die...I said I think about it, but I try hard not to think about it. I try to keep myself busy. And I talked to my mother about it. I talk about it every day because we are close, me and my sister [510:19-41].

Sylvia waited two to three months before going to the nurse about the lump on her breast.

The Community Experience

The transcripts of 23 informants were analyzed for the community experience. Of the informants, nine were elders, five were community health representatives, three were councillors, one was an administrator, and one was a Chief.

Two themes are a part of the community experience. In the theme, "Silence Surrounds The Stranger" silence about cancer is described from the community members' perspectives concerning their own silence and the silence they see from health care providers. The second theme, "Making The Stranger Known: The Healing Journey", describes the use of traditional Indian medicine as one way to manage cancer in First Nations communities.

Conclusion

Spiritual visions and dreams were important to First Nations People. Some health care providers recognize the value of traditional healers and elders in providing healing to First Nations People on an individual and community basis. The themes, perceived risk, metaphors, and cancer experiences provide valuable insight when analyzed within a cultural context. As a result of the findings, I provided recommendations for future nursing research, education and practice.

Acknowledgements

I express my sincere gratitude to the Anishinaabeq who shared their experiences with cancer in their communities. All my relations. I also thank the Northern Studies Training Program, the Eleanor Jean Martin and Jean Sifton Awards, Canadian Nurses Foundation; Northern Health Research Unit, Department of Community Health Sciences, University of Manitoba; Manitoba Association of Registered Nurses; Margaret R. Francis Award, University of Manitoba; and the Maurice Legault Clinical Cancer Nursing Fellowship, Canadian Cancer Society for financial support.

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II. ABORIGINAL EDUCATION AND CURRICULUM

Culture and Ethical Decision-Making in the Treatment of End Stage Renal Disease: The Experience of Aboriginal Communities

Joseph Kaufert[1], Lyle Longclaws[2], Brenda Elias[3], John McKenzie[4], James Ross[5], John Jeffrey[6], Adrian Fine[7], and Peter Singer[8]

This paper focuses on problems Aboriginal Canadians experience in making ethical and informed choices about the treatment of kidney failure. The research design, ethics, medical services, and theoretical framework used in this multi-disciplinary study of the cultural context of decisions are presented in the first part. A case study describing the experience of an Aboriginal client reconstructing the onset of renal failure and decisions about initial treatment is then presented within a theoretical and methodological context of research on the cultural context of choice. This case study highlights medical service issues, including service delivery, facing Aboriginal peoples in northern isolated communities.

Part I: Renal Failure in Aboriginal Communities

Our ongoing study of decision-making builds on prior research comparing patterns of end-stage renal disease in the Aboriginal and non-Aboriginal populations. Data from the Canadian Renal Failure Register showed that the incidence rate of renal failure

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among patients identified as 'Native' was 2.5 to 5.0 times the rate reported among the general population (Young *et al.* 1989). In 1992, members of the research group conducted a survey documenting the experience of Aboriginal patients while they relocated to Winnipeg in order to receive treatment for end stage renal disease (Kaufert *et al.* 1992). Semi-structured interviews were conducted with 40 Aboriginal patients, including 26 individuals using hemodialysis and 14 using peritoneal dialysis. The survey documented the practical problems experienced by clients in complying with treatment regimens. It also documented client and family perceptions of the quality of urban life following relocation necessitated by treatment. This preliminary research identified the need to document culturally-based explanations of kidney disease and treatment options in communication between Aboriginal clients, family members and caregivers.

The Cultural Context of Ethical Decision-Making

The universal validity of Western bio-ethical principles, such as autonomy, is increasingly being questioned by cross-cultural studies of ethical decision-making (Solomon 1997). The impact of ethnicity on health-related decision-making has been analyzed in terms of variations in therapeutic outcomes, patient compliance and research participation (Adelman 1983, Greenberg *et al.* 1988). Less attention has been paid by medical ethicists to cross-cultural research among ethnocultural groups who use western biomedicine in Canada and the United States. Only recently have social scientists and clinicians begun to attempt to document how principles and biomedical ethics are translated and interpreted in cross-cultural communication (Fox and Swazey 1984, Donnelley 1989, Veatch 1989, Walters 1989). Critics of "universalistic" approaches to ethics emphasize that biomedical concepts and models of decision-making do not adequately deal with the cultural context, structural barriers and differences in the dynamics of interaction between clients and providers in cross-cultural encounters (Kaufert and Putsch 1997, Young 1989, Weisz 1990).

For example, the bioethics literature emphasizes the value of maximizing individual autonomy as the dominant principle in ethical decision-making (Solomon 1997). Requirements that health institutions obtain written consent before initiating treatment are meant to maximize individual autonomy. However, full disclosure of information about prognosis, risks, and benefits of treatment may violate cultural prohibitions which limit the direct revelation of news of terminal prognosis. For example, Caresse and Rhodes found that the concept of advance directives or "living wills" specifying the situations where a person would want treatment to be discontinued conflicted with core values in Navajo communities in the United States (Caresse and Rhodes 1995). Explicit discussion of death and dying and prospects for palliative care in negotiations of advance directives must involve the "telling of bad news". A high percentage of Navajo informants interviewed by Caresse and Rhodes felt that explicit and direct discussion of death and dying could have negative consequences.

Other values may significantly influence the degree of autonomy and balance which members of any group expect in the relationship between healer and client. These values are directly relevant to consent agreements. Cree and Ojibway cultural values, for example, emphasize the need for compliance with whatever regimen a healer prescribes (Kaufert and O'Neil 1990). The autonomy of the individual is acknowledged, but counterbalanced by the need for the client to defer to the authority of the healer and to comply with proposed treatment regimen (Kaufert and O'Neil 1990). In contrast to

contemporary co-participatory, autonomy-oriented models of the communication between practitioner and client, Aboriginal clients are often expected to follow the healer's or elder's advice without the right to ask for additional information or to negotiate alternative treatment decisions. This accent on strict obedience to the healer may be difficult to reconcile with the emphasis on co-participatory decision-making advanced by contemporary ethics.

His emphasis on the autonomy of the individual patient may also contravene Aboriginal values, that stress the need to balance the interests and welfare of the patient with the interests of families and communities. It was found (Kaufert and O'Neil 1991) that Aboriginal patients frequently perceived the impact of a decision on their family or community as being as important as its impact upon themselves. The principle of client autonomy in decision-making, seen as a cornerstone of consent by bioethicists, does not necessarily reflect traditional relationships between Cree and Ojibway clients and their healers or form the primary principle for deciding the impact of a decision on the individual, the family, or the community.

We found some Aboriginal clients were more concerned with the development of trust in the relationship between the healer and client, than with the full exchange of information on risk and benefit in treatment (Kaufert and O'Neil 1991). Initiatives by First Nations to exercise control over health care in their communities may increasingly create situations in which conflicting values must be recognized and incorporated in cross-cultural frameworks for decision-making. Individuals, communities, and First Nations are increasingly demanding that treatment decisions should be culturally appropriate and should contribute to the empowerment of the client, family, and community (Kaufert and O'Neil 1991). This current program of research attempts to document the cultural context of ethical decision-making among Aboriginal renal clients, family members, and caregivers. Alternative, mutually-acceptable ways of communicating information about treatment alternatives and achievable life quality in individual decisions about care at the end of life are also being documented.

Methods

Both Aboriginal and biomedical cultural prospectives are documented through in-depth interviews with clients, family members, and caregivers. These interviews are used to develop case studies of clinical decision-making. Other interviews with clinicians, program managers, and policy makers document professional and institutional decision-making frameworks and approaches to resource allocation.

Participant observation is used to document decision-making involving clinicians and Aboriginal renal patients and their families as they negotiate advanced directives or do-not-resuscitate orders and consent related to organ donation and transplantation. Our preliminary interviews focus on the client's perspective on primary decisions. Through these narratives, we are able to document cultural values more fully, which influence ethical decisions made by the client, the family, and the professional caregiver. By interviewing both clients and their caregivers, we are attempting to understand the communication involving Aboriginal and biomedical explanations of kidney disease, of treatment options, and approaches to decision-making.

This research builds on longer term collaboration with the Native Services Programs and the Program in Nephrology at two teaching hospitals. Human subjects' protection is extended to patients, health workers, family members, and other key informants. Primary data is collected through voluntary confidential interviews, or direct observa-

tion of clinical decision-making. Formal consent agreements were supplemented with more interactive discussions with participants to ensure they understood how case-related information will be interpreted and represented (O'Neil *et al.* 1993).

Interpretation Issues

Our research program evolved from previous work on health communication involving Aboriginal language interpreters. In interpreter-mediated communication we found that primary values emphasized by biomedical ethics were not always compatible with the individual values and explanatory frameworks of Aboriginal clients.

Because of the importance of interpretation and cultural advocacy in decision-making, this project also focuses on the role of Aboriginal language interpreters in ethical communication. We recognize that both professional interpreters and voluntary translators from the client's family and community function as intermediaries and have a significant impact on communication between client and caregiver. For this reason, professional Aboriginal health interpreters were involved as primary research team members. Interpreters participated in preliminary interviews with clients as well as family members who speak Cree, Ojibway and specific dialects such as those used at Island Lakes. Interpreters also worked as research associates producing translations and participating in focus groups discussing the problems of communicating the linguistic and cultural meaning of biomedical and ethical concepts. The focus groups analyzed, restructured, and simplified basic questions about ethical concepts and decision-making processes. During this phase, the process through which caregivers work with interpreters to define illness, treatment options, risk and benefit issues, and approaches to decision-making were documented.

During final phases of the study, ongoing decision-making about treatment options, involving clients and family members, and clinical caregivers were observed. Part of this phase of the research focused on the impact of interpreters and family members. By studying interpretive processes it was hoped that resources would be created to facilitate communication that is more co-participatory, involving not only renal patients and care providers, but also family and community members.

Structural Constraints on Ethical Choice

These studies explore the way in which issues, emerging from the application of new and ethically-problematic technologies, are interpreted by clients, families, and caregivers. Advances in biomedical technology, such as renal dialysis and kidney transplantation, have raised new challenges in ensuring meaningful consent to initiate dialysis, donate or receive kidneys, or define situations in which treatment should be discontinued. The bioethics literature has focused on the philosophical principles involved in these decisions, but less attention has been paid to the social and political context in which decisions about care are made (Fox and Swazey 1984). Structural barriers including cost, location, and organizational bias may influence the access to dialysis and transplantation among renal patients from minority ethnocultural and socioeconomic groups (Plough 1987). The impacts of these structural barriers on Aboriginal client's and family's choices are also examined.

Decision-making in the treatment of end-stage renal failure requires complex social interaction between all those involved — patients, families, and health care providers. Nevertheless, the clinical and bioethics literature emphasizes the expectation that most people will act in clearly defined ways and that treatment protocols must adopt criteria

defining the "informed patient" who is able to understand treatment options and comply with complex regimens (Kaufert *et al.* 1992). Individuals who behave in ways contrary to those defined as legitimate are often seen by health care providers as behaving "inappropriately" (Fox and Swazey 1978). An alternative explanation, however, is that the source of their "problematic behavior" may lie in differences in cultural values and expectations of clients, caregivers and family members.

Part II. Case Study: Communication about Renal Failure, Urban Relocation, and Treatment Options

More fundamental differences in basic understanding of the onset of renal failure and its impact on lifestyle may also override communication barriers reflecting differences in culturally-based approaches to ethical decision-making. For example, our preliminary analysis indicates that sudden onset of renal failure did occur in many individuals. However, in approximately half of the cases it was evident that clinicians had monitored declining renal function for periods of months or years. In recalling treatment prior to renal failure many of these patients also described sudden onset of failure and asserted that they were not "informed" about, or prepared for, renal failure. Interviews with these patients' caregivers suggest that physicians and nurses did monitor and attempt to communicate an understanding of changing renal function. However, the caregivers' explanation of disease processes were not accessible in the sense that they were interpreted in a format which the patient could understand. This meant that the patient and caregiver did not have a shared explanatory framework for understanding illness and making treatment decisions. Patient narratives suggest that indicators of renal function, such as serum creatinine, sometimes became the primary focus of the clinician's explanation. By focusing on clinical indicators, communication between caregiver and client did not always engage the immediate impact of decreasing renal function or gradually introduce the individual to the prospect of living on dialysis.

The following case study, shown in the video presentation in the *Issues in the North Colloquia*, illustrates some of the barriers that may impede the meaningful communication about the process of renal failure and options for treatment. A videotaped narrative of a forty-seven year old man, describing his experience of kidney failure and treatment, documented the cultural, ethical, and personal dimensions of his treatment choices. Dr. John Mckenzie, a physician trained in nephrology and medical ethics, and Dr. Joe Kaufert, a medical anthropologist, conducted the interview. Mr. Bear (pseudonym), who came from a reserve community and who speaks both Cree and English agreed to describe his life experience and treatment decisions after the failure of his kidneys seven years ago. He stated that he wanted to share his experience to increase public awareness of the impact of kidney disease among Aboriginal peoples. He also wanted to increase sensitivity among providers to help them understand the problems of communicating information about the progression of renal disease and availability of alternate treatment options.

Mr. Bear stated that, at the time of renal failure, he had initially been treated using hemodialysis in a tertiary care hospital in Winnipeg. Later he used ambulatory peritoneal dialysis, which allowed him to return to his community. After five years of maintenance dialysis, he received a kidney transplant, which continued to function at the time of the interview. His story reflects one person's perception of ambiguity in the communication of diagnosis and initial treatment of end-stage renal disease. It emphasizes the impact of communication about long-term dependence on life-supporting

technologies of dialysis and renal transplant and the accompanying need for the client to make significant lifestyle changes. It also reflects the necessity to prepare for renal failure and appreciation of the uncertainty about when and where renal failure may occur.

Mr. Bear's account began with a description of the period in which he was experiencing declining renal function. His story emphasized his feelings of uncertainty about the way information explaining his impending renal failure was communicated.

Interpreter:
How long ago was it that your kidneys first stopped working? Did you have to go on dialysis first (before your transplant?)

Mr. Bear:
Yes, I'm not too good at dates. It was four years, prior to my transplant. I was somewhat different than I usually was ... in terms of the way I was in daily life. I used to work all the time and I was quite active and I slowed down when my breathing started to bother me.

Interviewer:
You experienced it in your work first of all... that was the only advance warning you had about your kidneys not working?

Mr. Bear:
Yes. I guess that was a warning. I really didn't know that was [what was] wrong until I went to the nursing station and they gave me pills for treatment, but nothing worked! ...

Interviewer:
When you were first told that your kidneys had stopped working did they talk about the kind of things you could do (e.g., the alternative treatments)?

Mr. Bear:
No. They never mentioned anything about my kidneys. Having trouble with my kidneys, first of all.

Interviewer:
No warning?

Mr. Bear:
No warning. I guess that the first thing they noticed was my creatinine ... [As] they call it. It was going up and up. They never told me about it.

Interviewer:
They never told you what creatinine was?

Mr. Bear:
(Reflecting on use of creatinine later in the interview) I wouldn't really say creatinine myself, really. All I know is that it's a sign that tells you your kidneys aren't working. But creatinine itself! It's something I've never said.

Mr. Bear:
They never told me what anything was until I came out [of the community]. They finally sent me over here [a tertiary care hospital], for a check-up and that's

when the doctor told me that my kidneys only had five percent of the functioning surviving. That my creatinine was very high, they [the caregivers at the nursing station] should have told me that, he (the doctor) said, but nobody ever told me that.

Interviewer:
They didn't tell you?

Family Member:
The nursing station knew about it a year before he was actually told that his kidneys were not working.

Mr. Bear:
Yes.

Interviewer:
So they could have given more advance warning?

Mr. Bear:
Yes

This exchange both emphasizes Mr. Bear's ambiguity about when he was told he would experience renal failure, and reflects the extent to which he has incorporated the clinical indicator of decreasing renal function (serum creatinine) in his explanation. The indicator appears to be disassociated from his understanding of the life impact of final kidney failure and the need for dialysis. Other patients emphasized this dimension of "suddenness" in their experience of renal failure. Some also acknowledge that caregivers probably had communicated the "technical facts" about renal failure. However, they have emphasized that caregivers' explanations often did not balance messages about renal failure with more hopeful messages about the forms of treatment that are available.

Personal and Family Adaptation to Treatment and Urban Relocation

Mr. Bear's continuing narrative focused on the extent to which clinicians did not communicate it in language or concepts that permitted the patient to prepare for life changes necessitated by kidney failure. Renal patients on dialysis or living with functioning transplants must follow rigorous regimes, which restrict freedom of movement, are sometimes painful, and always involve risk. Throughout other interviews, we found that clients and family members discussed barriers to compliance emphasizing need to balance the demands of treatment with other responsibilities to family and communities. Many clients emphasized the need to sustain some quality of life, as well as to survive. Often clients' definition of treatment success and life quality involved their capacity to participate in valued work or symbolic family and community activities. Several stated that relocation of themselves and their families from their home communities to Winnipeg profoundly influenced the quality of everyday life. For instance, the crisis of renal failure, necessitating relocation to receive dialysis in Winnipeg, represented a traumatic transition for Mr. Bear. He felt unprepared to deal with the psychosocial and cultural change of urban relocation and continuing dependence on hemodialysis.

Interviewer:

When they first talked to you about renal failure, were they clear about what it would mean or was it hard to understand?

Mr. Bear:

They just said that "the kidneys no longer work so you're going to have to use a machine to clean it up for you". When I got here, they said I only have five percent [of my] kidneys functioning. That means you can't go home again! You're stuck in Winnipeg. You're stuck on this machine for life! That's it! That's the way they broke it to me ... When they first told me I had kidney failure, 5% [of my kidneys working] didn't even qualify me to go home for a while. Things [that] I needed to sort out myself, that I needed to put away. The only thing I had to do, the message I got from them [caregivers] was that I have to find a place here to live right then and there. I wouldn't ever be able to go home, but the next thing they mentioned was to relocate to Winnipeg with my children, send for them, not go get them. ... The chance of my taking time off to go and do these things was nil.

Interviewer:

Because you had to dialyze every day?

Mr. Bear:

Every third day. That's the thing they told me the first time. Then after awhile they say you have to use the machine. They showed it to me. The machine I would be using for life which means you can't take it home because there's nowhere to plug it in even if you take it home.

Interviewer:

There wouldn't be electricity [in your home community]? You couldn't use a dialysis machine at home?

Family Member:

The power there is not strong enough.

Mr. Bear:

They said "you cannot take it home and that's it". So I was stuck here. At that time, it never occurred to me to ask that many questions. All I thought was "I'm stuck here". I was so confused!

This final section of Mr. Bear's narrative emphasizes the extent to which the rapid transition to renal dialysis is often associated with relocation to an unfamiliar urban environment. Although non-Aboriginal people experience the same trauma with renal failure and often have to relocate to receive treatment, urban transition for Aboriginal clients and their families appear to involve unique stress or are associated with the need to rapidly learn urban survivor skills.

Several informants in the study shared similar stories and stated that they too would live in their home communities using ambulatory peritoneal dialysis rather than remain on hemodialysis in urban or regional treatment centers. Many people were informed that they could not utilize peritoneal dialysis in their home communities because of clinical counter indicators or lack of community infrastructure such as water and sewage systems. Care providers emphasized survival time and compliance in decision-making involving choices of dialysis. Mr. Bear like many others however, clearly indicated that

treatment options and compliance with complex regimes requires more than a menu approach to create an informed consumer choice among treatments.

Conclusion

This paper has described the methodological and theoretical framework of an ongoing research project focusing on the experience of Aboriginal Canadians and their caregivers in making ethical, informed choices about the treatment of renal disease. Using a single narrative to illustrate significant communication problems, it can be observed that mutual culture awareness of Aboriginal and biomedical values may not develop in exchanges between renal failure patients and their caregivers. Of particular significance is the observation that patients felt they were not told, or did not understand rapidly progressive renal failure. They felt that they were not prepared for a future in which they depended on dialysis. They expressed the need for more emphasis on empowering communication which integrated a recognition of the cultural, economic, and organizational barriers faced by Aboriginal people. Some informants emphasized the need to balance hope and reality in communication of information which was abrupt and overwhelming in its impact. The process of informing patients required negotiating consent with the caregivers to develop a continuing dialogue in which family members and members of the community support systems are all involved.

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Alternative Forms for Delivery of University Education in Remote Northern Communities

Charles R. Shobe[1]

Post-Secondary Education Needs

Northern Manitoba communities can be classified into one of three groups: **Industrialized centres** (with predominantly non-Aboriginal residents, an industrial, transportation and/or government service employment base, and well-supported educational services/facilities); **Northern Affairs communities** (with predominantly Métis residents and some non-Aboriginal persons, a non-industrialized economic base and very limited education services/facilities); and **First Nation communities** (with predominantly Aboriginal residents having treaty status, a non-industrialized, but growing small-business base, and some communities with high schools). Between 1981 and 1991, only the First Nation communities exhibited an increase in population.

In 1991, only 47% of people over age 15 in First Nation communities had a grade nine education. This compared to 85% in the Industrialized communities and 66% in Northern Affairs communities. In Industrial communities, 42% of residents had graduated from a post-secondary or vocational institution. That figure fell to 23% for Northern Affairs centres and only 11% for First Nation centres (Peat *et al.* 1993).

Northern labour force characteristics in 1991 were also summarized in the Northern Manitoba Economic Development Commission (NMEDC 1993) report because of their implications for training requirements. The breakdown for jobs in various occupational categories was as follows:

Primary Industries	17%
Manufacturing	10%
Construction	7%
Transportation/Utilities	10%
Trade/Finance	14%
Government Services	11%
Other Services	31%

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"Primary Industries", comprising fishing, trapping and a minute agricultural sector, and "Other Services", including retail sales, cleaning and janitorial services, etc., constitute about 48% of the total labour force requirement. The occupations in these two categories tend not to require college or university training.

Occupations in the remaining five categories do tend to require post-secondary education. For the leaders of smaller, more remote First Nation communities where education and employment levels are low, access to post-secondary education to prepare for the occupations and professions in those categories is especially important, given that community aspirations with respect to self- government and local control of programs and services are very high.

The NMEDC (1993) report recognized that participation in post-secondary education usually required that students (and their financial resources) leave the northern region, and alluded to the concern that success rates for Aboriginal students in first year college and university programs are very low in comparison to non-Aboriginal students. Similar economic and performance concerns have been expressed regularly by Education Authorities and Tribal Councils. However, these issues are very sensitive, and there are virtually no published, comprehensive reports on attrition and completion rates for these students, even though the anecdotal information is well recognized.

Education Authorities and Band and Tribal Councils are also very concerned that Aboriginal post-secondary education students who study successfully "on campus" are much less likely to return to their home communities on graduation to live and work. As a consequence, not only have significant financial resources left the community, but also the knowledge and expertise that they have purchased has been lost to the community and its people.

In contrast, there is another body of anecdotal knowledge which suggests that adult education programs which are delivered on site in First Nation communities are significantly more successful in terms of student retention and successful course completion, and retention of graduates in their home communities (Shobe 1993).

For the past 30 years, the Brandon University Northern Teacher Education Program (BUNTEP) has been an outstanding example of a successful full-time, community-based degree program with a high success rate (Lyon 1987). A significant number of college-based technical and vocational courses and programs have also been delivered on site on a full-time basis in many northern communities with completion rates that frequently approach 90-100%.

In contrast, Aboriginal students who have attempted full-time, on-campus study have tended to withdraw during their first year (often prior to Christmas) at rates exceeding 75-80%. The potentially significant economic efficiencies of full-time community-based programs over campus-based programs for First Nation funding agencies is evident from this brief comparison.

By way of a further contrast, it has been Inter University North's (IUN) experience over the past ten years that courses offered on a part-time basis to Aboriginal students in First Nation communities have very high attrition rates. Consultation with former students and education officials suggest that students in communities with limited employment opportunities, and students with a prior history of unsuccessful participation in post-secondary study who have little or no continuous access to student support services probably lack the motivation and study skills needed to persevere with part-time study. Programs such as the Northern Business Management Training Pro-

gram which was strongly supported by the Swampy Cree Tribal Council have also experienced this problem.

The Challenge

The challenge to colleges and universities is clear — find ways to deliver full-time, community-based programs off-campus, especially in small, widely scattered rural and northern centres, taking into account the needs and interests of those communities and their residents. This challenge is further complicated by the fact that:

- these communities tend to have a poor telecommunications infrastructure which limits some of the course delivery options that may exist;
- prospective students often have either a deficient educational background for post-secondary study, or a history of prior failure that limits their motivation and aspirations, if not their interest; and
- cultural differences (barriers) exist between Aboriginal communities and people, and the predominantly non-Aboriginal institutions that usually provide post-secondary education services.

Despite these complications, progress is being made to address this challenge in several remote centres using existing resources and the creativity and good will of a number of interested parties.

Resources

Within Manitoba, four publically-funded universities and three colleges are accredited to offer a very broad array of technical, vocational, and professional education programs, and mandated to deliver those programs widely within the province. In Northern Manitoba, Keewatin Community College (KCC) and the associated Inter Universities North (IUN) Program are able to deliver or broker the delivery of all but a small number of professional and high technology programs. As well, the Manitoba universities can deliver Education, Social Work, and Nursing degree programs over and above the services provided through IUN. Thus, the potential for program delivery in the North is very high.

IUN and KCC both receive provincial grants to support course and program delivery. As well, Tribal Councils and Education Authorities have access to very significant financial resources to sponsor Aboriginal students in post-secondary study. On the other hand, the Métis people in Manitoba have somewhat less access to financial resources to support post-secondary study. All in all, however, there would appear to be more than adequate financial resources in aggregate to support a quite comprehensive program of post-secondary studies, including community-based study, and perhaps even enough money within the First Nation communities to support the development and operation of a separate, possibly private, Aboriginal post-secondary institute.

In many northern centres, existing facilities could be converted and dedicated to housing an adult education program. In other centres, land and services are available so that portable classrooms could be set up. At least two communities have already built special purpose adult education centres, and others are planning for such construction. Accommodation for visiting instructors is also available in most centres, and in those with limited public accommodation, arrangements have been made on many occasions for instructors to board with families in the community.

High schools in the communities are being equipped with increasingly sophisticated laboratories for high school science courses that can be upgraded at a modest cost to

support college and first year university laboratory courses. Up-to-date computer laboratories are already located in all but a few of the smallest communities.

From this, it is evident that through appropriate cooperative ventures it would be possible to organize financial resources, equipment, and facilities to offer an array of full-time college and university programs in specific communities or on a regional basis that would address many of the pressing post-secondary education needs of the North, and especially those in the rapidly-growing First Nation communities.

Course and Program Delivery Options

Although distance education programs are frequently identified as a major option for program delivery to the smaller Aboriginal communities, two key factors may limit its application in the immediate future. First, since the most common distance delivery strategies (correspondence education and teleconferencing) tend to be impersonal and somewhat unidimensional — characteristics that are inconsistent with the holistic, inter-personal, observational learning style seemingly preferred by Aboriginal people — there is resistance on the part of students and their sponsoring agencies to using distance education methods for course delivery.

As well, a high percentage of Aboriginal people who wish to undertake post-secondary study come to the programs as mature entry students needing preparatory courses to strengthen their academic competencies in mathematics, English and writing skills, and support services to help them re-establish strong learning and study skills in order to cope effectively with post-secondary study. Those students are likely to benefit during the early stages of their programs from more direct, one-on-one interaction with instructors, tutors and student support persons than can be provided effectively and economically through distance learning technologies at this time.

Distance delivery strategies are likely to be more effective and more widely used when more complex, interactive distance delivery technologies are in place (such as one-way and interactive video conferencing, computer conferencing, and multi-media Internet-based courses), and for courses taken after students have strengthened their basic academic and re-established effective study skills.

While there are essentially no examples of successful distance delivery of post-secondary programs in northern Aboriginal communities at this time, KCC and IUN are engaged in planning for interactive video conferencing facilities in a number of northern centres, including at least three First Nation communities, which could be used for distance delivery of college and university courses in the future.

The communities in which those facilities will be located are currently hosting a variety of successful full-time, community-based college and university programs. As students progress through their programs, it would be reasonable to introduce occasional lessons using distance teaching methods, and working up to the delivery of intermediate and upper level courses entirely through distance delivery. For the present, however, full-time, on-site, community-based program delivery appears to be the most successful, effective, and efficient method for providing post-secondary education programs in Northern First Nation communities.

Program Models

A variety of programs exist to date. The following examples are drawn from the BUNTEP, IUN, BSW, BN, and Transition year programs.

Brandon University Northern Teacher Education Program (BUNTEP) — The BUNTEP program has been well documented and will be described only briefly. Housed at Brandon University, BUNTEP delivers a B.Ed. program for primary teacher training on a full-time basis in a discreet number of participating First Nation communities. The program has a limited number of course selection options, and a complement of full-time professors who travel to the communities to teach. The host communities must provide facilities to house the program. Normally, students enter as mature entry students and during their first year take a number of preparatory courses so that the 4 year degree is actually delivered over a five year period. The program has been very successful, with a relatively high completion rate overall.

Inter Universities North (IUN) Full-time Community-based University Programs — IUN currently offers courses in 32 communities, 30 of which are located north of the 53rd parallel. Of those, 15 are accessible by road and 15 are isolated, "fly-in" communities. In three communities — God's Lake Narrows, Cross Lake and Nelson House — IUN is delivering full-time university programs with on-site instructors.

The God's Lake Narrows program was initiated in February of 1992 with an intake of 25 students. Eight of those students will have completed all of their studies in the community and are expected to graduate with B.A., B.Ed., or B.G.S. degrees in 1997. Six students who transferred on campus to pursue other degree programs midway through the community-based program are also expected to graduate shortly from programs completed on-campus.

The Cross Lake program was initiated in the fall of 1994 also with an intake of 25 students, 16 of whom will have completed all of their studies in the community and graduated with a B.G.S. degree in 1997. Very few students transferred on-campus from the Cross Lake program, and some of those transferred to college programs.

The Nelson House program has been operating for just over a year, and students are not expected to begin graduating until 1999. However, the Nelson House program model will differ from God's Lake and Cross Lake in that, for a number of reasons, the students may be required by the Education Authority to complete the final year of their degrees in an on-campus setting.

IUN's full-time community-based programs have some parallels with the BUNTEP program model, but some significant differences as well. The major differences are: first, that the program and courses offered will be tailored to the needs of the community as expressed by a Community Program Advisory Committee, and interests of the students — it is not a set program that is the same in every community; second, that the program is a true partnership in which the universities deliver the program and courses requested by the community, IUN staff and financial resources support program planning and delivery, Education Authority and Tribal Council financial resources also support program delivery, and facilities are provided by the community for classroom space, laboratories, and instructor accommodation; and third, that two courses are usually delivered at the same time to provide variety for students and to more closely simulate the on-campus experience where students take as many as five courses at the same time (BUNTEP delivers one course at a time).

As with BUNTEP, there is a full-time Centre Coordinator responsible for student, instructor and program support in the community. Unlike BUNTEP, that person is employed by the Education Authority, not IUN, and is as much responsible to the Community Program Advisory Committee for ensuring that community and cultural concerns are respected during program delivery as to IUN for ensuring that the student support and program delivery infrastructure is in place and operating effectively in the learning centre.

Unlike BUNTEP, the IUN full-time program does not have a complement of full-time professors since the degree programs and courses offered vary from community to community. Instead, IUN requests instructors from the universities as required, and has established a procedure whereby, in most instances, a representative from the community is asked to participate in the instructor selection process. IUN also hosts cross-cultural orientation workshops for instructors at least once and often twice each year, and arranges for instructors to make an orientation visit to the community, if at all possible, prior to the start date for the course.

Bachelor of Social Work by Distance Education in St. Theresa's Point — This full-time program is carried out by a unique partnership involving the St. Theresa's Point (STP) Education Authority, The University of Manitoba's (UofM) Faculty of Social Work and Division of Continuing Education, IUN, and the Saskatchewan Indian Federated College (SIFC). The latter agency plays a very important part in the program for two reasons: first, there are no formally accredited Aboriginal post-secondary institutions in Manitoba that can offer university-level courses with a distinct Aboriginal cultural focus in Social Work or in related elective areas; and second, SIFC has Aboriginal faculty members who have considerable experience successfully delivering university-level courses to First Nation students. At the request of the STP Education Authority, the UofM agreed to involve SIFC in the planning and delivery of this program.

Although the program plan calls for a substantial component of the program to be delivered using distance education methods, it is still too early to determine whether the delivery strategies that are contemplated will be able to overcome some of the challenges identified earlier in this paper.

Bachelor of Nursing Program (B.N.) in Norway House — The full-time B.N. program initiated in September, 1996, in Norway House involves the University of Manitoba (UofM), Keewatin Community College (KCC), IUN, and federal and provincial funding agencies. The first year of the program has been devoted in large part to preparatory and first year university courses delivered through IUN. The Nursing courses, including clinical courses will be provided by UofM with support from KCC which also offers an RN program in the North. Hospitals in Norway House, Thompson, Winnipeg, and perhaps other centres will serve as sites for students to gain clinical experience.

An interactive video conferencing system will be installed in part to support distance delivery of courses or parts of courses by specialists in various disciplines, and to give the nursing students visual — if not physical — exposure to a wider array of medical and nursing conditions.

Transition Year Programs (TYP) — TYPs are joint ventures by KCC, IUN and a host community to deliver a combination of preparatory and first year college and university

courses on a full-time basis in that community. At present, TYPs are running in Cross Lake, Norway House and Nelson House. Interest in hosting TYPs next year has been expressed by Split Lake and Oxford House.

Operationally, the TYP is similar to the IUN full-time programs, with on-site coordinators hired by the community to support the program and assist students, Community Advisory Committees that determine the overall direction of the program for that community, including course selection, and a bank of part-time instructors (selected whenever possible with community input) who travel to the community to teach their courses. No distance education courses have been offered to date.

The intent of the programs is to provide mature entry-level students and grade 12 graduates in First Nation communities with a variety of college and university courses and a taste of post-secondary study, while at the same time assisting them to strengthen their academic competencies and study skills in preparation for further post-secondary study. The programs have been running for two years, and have been very successful to date, with program completion rates ranging from 60% to 95%.

Future Possibilities — For several years now, a number of independent full-time study projects have been successfully trialed in a number of remote (and not so remote) northern First Nation communities. BUNTEP is an example of a specific purpose full-time community-based degree program offered in specific communities. The IUN full-time programs have offered a broader range of program options to students, but have also been developed for specific communities. The full-time B.S.W. by Distance Education and B.N. Programs have been developed as specialized programs, but have a regional service mandate. The Transition Year Programs represent a combined college and university effort to provide post-secondary education services in response to community needs, and, to some degree, represent an early move towards community-based post-secondary education programs that operate on a recurring annual intake basis.

In all of these cases, the programs are offered because the communities, the institutions, and governments have contributed resources to a partnership that supports program delivery. Emphasis must be placed on the special role played by Education Authorities and Community Advisory Committees in ensuring the success of these projects.

Looking to the future, one could envision a time when Transition Year Programs are running in most First Nation communities. Students who successfully complete those programs might then move into a full-time program in their own community or transfer to a specialized regional program in Social Work, Education, Nursing, or Business Administration. Other students might move to a general program offered at a regional centre, and then transfer on campus to complete medical, legal or graduate studies in a variety of disciplines.

First Nation organizations that are exploring models for the development of a First Nation post-secondary education institute might want to consider de-centralized models such as the ones described above rather than a centralized institutional model. This approach would recognize the varying needs and interests of First Nation communities in Manitoba, would support a much higher success rate for students than existing campus-based models achieve, and would build on models for de-centralized delivery that are already proven to be successful.

IUN is currently planning, with a number of First Nation communities and KCC, to sponsor an external evaluation of a range of full-time community-based programs in order to continue to improve program design and service to students. The results of that evaluation may also be of interest to First Nation institutional planners.

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Northern Perspectives and Northern Options: A Community-Based Post-Secondary Transition Year Program

William Alcorn[1]

Background to the Program

The following discussion on a community-based, post-secondary, transition-year program is an exploration of a concept conceived in the North, by northerners, to meet perceived northern problems. This concept emerged through a consultation process that involved northern academics and educators, university, college, and high-school personnel, Aboriginal and non-Aboriginal peoples, and business and work-force representatives. The multifaceted problem they tackled included:

a) the overwhelming financial costs to individuals and communities to send their people south to obtain a post-secondary education;
b) the low successful graduation rates for northerners in general, and Aboriginal people in particular;
c) the drain on communities to continually have many of the brightest citizens leave to take up studies in the South, and then never return;
d) the cost of re-training southern-educated graduates to meet northern concerns;
e) the lack of informed choices in the North for people to consider as possible career options;
f) the loss of role-models for northern youth in secondary education; and
g) the cross-cultural shock that northerners face when they re-settle in the South and the cross-cultural shock facing anyone entering a post-secondary institution.

Throughout the consultation and planning processes, program design, and initial delivery, one belief held steadfast: *problems in northern Manitoba require a northern Manitoba solution.*

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Ecologically-sound development in the North will only occur when educated and informed northerners take control of their own lives, which includes their educational opportunities. This was the dominant theme that emerged from a 1990 conference at the University of Manitoba — *People and Land in Northern Manitoba* (Lithman *et al.* 1992). Programs and institutions like those in the south are often viewed as inadequate or inappropriate for the North. What was required was a distinctively northern program. The idea of new vision for northern programs is comparable to Clark's (1985) argument for a paradigm shift in research methodologies. Clark stated that:

> Slowly, but inexorably, our understanding of organizations and organizing will be illuminated by new perspectives. Cumulatively, these perspectives will define and refine an alternative paradigm that will become the progenitor of numerous competing theories and structures. (p. 77)

The rejection of "educational systems or programs developed in the south" is akin to Aboriginal peoples' rejection of the idea of simply "taking over" health care, social, and other services that were developed (and that are currently being delivered) by non-Aboriginal people. Taking over existing programs only results in a continuation of the same kind of service (i.e., one developed by non-Aboriginal people) but delivered by Aboriginal people. Some Aboriginal people argue that this is potentially more damaging than having non-Aboriginal people deliver the service because when Aboriginal people take over there is a danger that the Aboriginal community will mistakenly begin to view this program as an Aboriginal program founded on Aboriginal values (Loyie 1992, Pompana 1997). This misperception, in turn, leads to a further denigration of Aboriginal culture and the view that Aboriginal people cannot provide their own services.

A number of participants involved in the evolving conception of the transition-year program experienced the emergence of a new model by stepping outside the bounds of traditional inquiry and simply asking new, more relevant, questions. In 1994, the community of Nelson House completely restructured the traditional Manitoba kindergarten to grade twelve school year in favour of a year-round-school program that met local community needs.

In another case, in 1993, a group of northern academics and Aboriginal people began providing a daycare service for the children of post-secondary students in Thompson. The underlying principle of this daycare service was that both the governance and daily operation would be structured on traditional Aboriginal values and consensual decision-making processes. Further, the daycare would conduct at least half of its daily activities in one of the First Nations languages (Cree, Dene, or Ojibway). These tenets were founded on the concern for retention of Aboriginal values through language preservation and that the governance and organization of the daycare had to emulate traditional Aboriginal values (Gamey *et al.* 1994). It required months of negotiation with government bureaucracies to simply incorporate the Keewatinowi Awassisak Opi-Ki-Wak Daycare without the hierarchal structure found in most organizations. The model that emerged from the daycare experience is three dimensional and interconnected (Alcorn and Gamey 1995). Similarly, the transition-year program began with a complete rejection of many of the traditional principles of higher education.

Northern Manitoba: The Place and The People

As the focus of this study is on a transition-year program for northern Manitoba, it is necessary to delimit the boundaries of area under discussion. Northern Manitoba is generally considered to be the area north of or bounding the Saskatchewan River on the west side of the Province and the fifty-second parallel to the east. Other descriptors of this area are southern boundaries of Treaty Five, the Northern Development Agreement line, and the Churchill constituency. Different interpretations of northern Manitoba cause slight changes in the demographic characteristics of the area; however, any calculation would put the area in excess of 300,000 square kilometres with a population in excess of 75,000.

The major industrial communities are Thompson, Flin Flon, Churchill, Snow Lake, Leaf Rapids, Lynn Lake, Grand Rapids, and The Pas. All these communities now house significant Aboriginal populations, and the latter two are separated from First Nations reserves only by the Saskatchewan River. Communities with more than 1000 residents that have predominately First Nations populations are Norway House, Cross Lake, Nelson House, Split Lake, God's Lake Narrows and God's River, Island Lake (Garden Hill, St. Theresa Point, and Wasagomach), and Pukatawagan. Other communities with populations near 1000 people are Cranberry Portage, Wabowden, and Brochet (Manitoba Government Services 1989, Weir 1983). The vast expanse of the area makes a brief description difficult. As such, Thompson and Norway House serve respectively as examples of a northern industrial centre and a northern First Nations centre. It is important to note that these centres are not typical in that they both are larger than other northern communities and they both act as service centres.

The City of Thompson is ideally located to provide coordinated services to the outlying communities. Located on the banks of the Burntwood River, Thompson was founded in 1958 with the discovery of nickel by the International Nickel Company of Canada (INCO). With a population of 15,000, it is the largest community in northern Manitoba and the third largest city in Manitoba. The direct area serviced by Thompson is approximately 150,000 square kilometres with a population in excess of 40,000. The indirect area extends to northern Saskatchewan in the west and almost as far south as Winnipeg on the east side of the province. As such, Thompson is a modern urban community with the same social problems as other urban centres. It is also a major relocation and service centre. On the other hand, the city retains distinct northern characteristics and the accompanying problems facing northern municipalities.

As a service centre, Thompson hosts a regional hospital, a high school that accommodates surrounding communities that do not have the population to support a range of high school courses, the Keewatin Community College Thompson Campus, the Manitoba Keewatinowi Okimakinak (an organization representing the northern Bands), Keewatin Tribal Council, Awasis Agency, and two university ACCESS programs: the Northern Bachelor of Social Work Program (NBSW) from the University of Manitoba and the Brandon University Northern Teacher Education Program (BUNTEP).

Thompson exemplifies the social conditions that have existed in most of the major urban centres such as Flin Flon and The Pas, which have each experienced boom periods that drove the population toward the 20,000 level. Even Lynn Lake, with a current population just over 1000, at one time boasted nearly 5,000 people. Thompson, centrally located in the northern half of the province, serves most northern communities with regular scheduled flights from its airport. Thompson is also the gateway to most of the communities having road access. (Many of the communities only have road access in

winter.) It is also connected to the Churchill railway line by a short spur. However, The Pas still serves as the point of departure for trains running to Flin Flon, Lynn Lake, Churchill, or Thompson.

Norway House, located just a few miles north of the point where Lake Winnipeg drains into the Nelson River, has a population of approximately 4,000 people, most of whom are members of the Norway House Cree Nation. Historically, Norway House was one of the major in-land trading posts. Almost all traffic between York Factory on Hudson Bay and the rest of western Canada funnelled through Norway House. As most of eastern Manitoba still depends on winter roads to freight goods and for transportation, Norway House and its neighbour community Cross Lake are important service communities. Both Norway House and Cross Lake are regional airbases.

Norway House is also one of the Northern Flood Agreement communities that negotiated compensation and land transfer packages for treaty and historical lands lost to flooding. Though Norway House itself was not as severely impacted as many of the other First Nations communities, many of its historical hunting, trapping, and harvesting areas were adversely affected (Waldram 1993). However, the economic development of the community is now 'in limbo' while the Band negotiates outstanding Northern Flood Agreement claims and identifies and provides educational programs for its citizenry that will effect the transition to new job opportunities and lifestyles.

Current post-secondary educational programs range from apprenticeship training delivered in partnership with the Aboriginal Apprenticeship Training Initiative and Keewatin Community College, college preparation programs delivered by the community under the auspices of Keewatin Community College, the Transition Year Program, and a Bachelor of Nursing Program in conjunction with the University of Manitoba. Norway House and Cross Lake are both negotiating the delivery of other programs such as social work, counselling, and business administration. These two communities expect to host 400 to 500 post-secondary students by 1998.

Northern Manitoba: Changing Places and Faces

As indicated above, the population in the North can generally be described as approximately 35,000 mostly non-Aboriginal people living in six or seven resource-based industry towns or cities and 35,000 Aboriginal people living in remote and reserve communities. Another 5,000 or so non-Aboriginal people live in small farming or remote communities. This description is extremely generalized as in the last few years large numbers of Aboriginal people have migrated to the urban communities.

Another phenomenon that will have a profound impact on this area is the birth rates in the Aboriginal communities as compared to the non-Aboriginal populations. Hull (1986) reported that in 1981 forty-four percent of the First Nations population was under 15 years of age, as compared to approximately twenty percent of the non-First Nations population. Hull also reported that Indian families continue to average twice the number of children that are found in non-Indian families. More recent data indicates that by 1993 more than fifty percent of the First Nations population was less than 25 years old, while only thirty percent of the non-First Nations population were in this group (Indian and Northern Affairs Canada 1995). These figures point to a massive population explosion in the First Nations communities in the next few years.

Some of the problems associated with this escalating population in the Aboriginal communities include a dependency ratio that does not allow for a sufficient population in the workforce age group of 15 to 65 to provide support to the non-workforce age

groups (Lithwick *et al.* 1986). Accompanying problems include a shortage of professional people to provide services to the community. These problems would exist even if all the present college and university participants in or from the North were successful. The problem is exacerbated by the lower participation rates in the north and especially the Aboriginal communities and the high drop-out rates for those who do participate (Armstrong *et al.* 1990).

The social conditions of the working classes and Aboriginal people in northern Manitoba have not changed significantly since Porter (1965) published his seminal study on Canadians. Porter identified four social barriers: "inequality of income and wealth", "family size", "regional differences in educational facilities", and "the great influence religion has had on educational policies". He also identified psychological barriers. He stated that:

> If suddenly education became as free as the air, many would not choose it. In a free society such a choice is everyone's right, but there is a great deal of evidence that the desire to stay in school and continue to university is related principally to the position which the family occupies in the general social structure, particularly its class position. (p. 172).

The ramifications of Porter's thesis can be seen in the horrible social experiments propagated by the governments and industries in northern Manitoba.

Waldram (1988) elucidated the effects of the psychological trauma that people encounter when faced with the upheaval of dislocation and relocation. He traced twenty-five years of the "destructive spiral" that overtook the lives of the people from Chemawawin when they were forced to relocate to Easterville. He then showed how, in spite of the lessons that the governments and Manitoba Hydro learned from the Chemawawin/Easterville experiment, they have replicated the situation in other northern communities with the same abominable environmental and social devastation. As an ironic example, the "model" towns built for the relocated residents of Chemawawin and South Indian Lake have no connection to the actual living conditions of the north. Waldram pointed out that "the new homes operate on electric heat, and are poorly insulated and difficult to keep warm." He adds that "we have the paradox of a community asked to make a sacrifice to allow for a hydro development but unable to afford its own hydro bills!" He concludes that the only hope of ameliorating the present situation is to commence a sustained developmental process that foregoes southern "modernization" in favour of local solutions.

The situation for Aboriginal people is made even more insufferable by the fact that, as they are being forced to leave their communities because of the destruction of the habitat and the subsequent loss of an economic base, they find themselves moving to the resource-based towns and cities at a time when there are major cut-backs in the local workforces. For example, the International Nickel Company of Canada in the Thompson area is now able to extract the same tonnage of nickel in 1994 that it did in 1974 with less than one-half the workers. Another example is the decline in the number of workers hired each year to work in the mineral exploration industry. Northern exploration contracting companies that used to hire between three hundred and four hundred workers every winter now hire between thirty and forty workers.

Like their separate histories, the Aboriginal and non-Aboriginal people are separated by the same economic and social forces that affect their lives. As unemployment

increases in the non-Aboriginal population, the competition for jobs becomes more fierce. As shown in case after case, minorities, and especially Aboriginal people, suffer most in mean economic climates. For both groups, the solution to many of the economic woes is to find relevant and accessible opportunities to higher education.

Ethnicity, Socio-Economic Status, and Opportunity

The following brief history provides a few cases representative of the systemic subjugation of blue-collar workers and Aboriginal peoples in northern Manitoba. The rift between non-Aboriginal developers and Aboriginal people is evident in two cases: the advent hydro-electric generating stations and the founding of Thompson. A third case provides examples of systemic exploitation of the northern workforce by government and industry. A fourth example elucidates the systemic exclusion of Aboriginal peoples from educational and economic opportunities.

Since the demise of the fur-trade, Northern Manitoba has two parallel histories — one addresses the resource-based towns and the railways that connect them; and a second is the history of Aboriginal people before and since the arrival of the first Europeans. The advent of hydro-electric generating stations in the 1960s brought these histories together on a "collision course".

By the 1970s, large areas of northern Manitoba were flooded to create reservoirs for the hydro-electric power stations. This flooding resulted in the loss of livelihood to hundreds of Aboriginal fishermen and trappers. Many of the communities affected by the flooding also had to be relocated. The following excerpts, the first from Doris Young and the second from Dave Young (no relation), encapsulate the dissimilarity of First Nations and non-Aboriginal views on the use of the land. Doris Young (1992), a Cree woman from northern Manitoba, stated:

> There is a saying that when you destroy nature, you are destroying yourself. I believe that this is true. When our land was destroyed, my culture was immeasurably altered. The lessons that my family taught me about life, when I was young, were lessons that were related directly to Mother Earth; the plants, the animals, the fish, the water. Our socialization process was thus connected to our relationship with the universe. We learned to be respectful and to care for Mother Earth and one another. We learned to share the abundance that she provided. Yes, the flooding of our lands altered our culture and changed our lives forever. (p. 19)

Dave Young (1992), a non-Aboriginal person from southern Manitoba who has been a consultant to Manitoba Hydro, stated:

> We, the people of Manitoba, in 1963, decided there was ten-million horsepower, more or less, in the Churchill-Nelson River system to be developed for our benefit. By 1966 the government that we had duly elected, and which was popular at that time, announced that "we the people" of Manitoba would go into the North and develop the Churchill and Nelson River system. This was not something that was done by Manitoba Hydro, or five or six engineers, or seven or eight bad people, or some nasty bureaucrats. We did it and the appropriate pronoun to use is we. The Northern Flood Agreement is about our relationship with the land and the resources in the North. It is about the way "we the majority" of Manitobans have treated the ten thousand people or so who had the misfortune, or who found themselves in any case, to be living along

> the waterway that was going to be affected by our plans to develop ten million horsepower. (pp. 181-182)

Not only do these excerpts highlight different views about the land, but implicit in these views are the more important beliefs about life that are inherent in the two views. (Also worth noting is the fact that First Nations had very little voice in the "we" that Dave Young is talking about, as First Nations people were only allowed to vote for the first time in 1960.) This disruption in lifestyles that had ties to the land going back thousands of years resulted in a migration of Aboriginal people into the urban communities, especially Winnipeg and Thompson (Weir 1983).

The situation in Thompson is representative of the experience of resource-based communities in that the initial population was largely immigrant and migrant. As the first wave of Thompson residents were young labourers hired to work the mine, the population in the sixties was 90 percent in the 18 to 40 year age group. There were almost no senior citizens or teenagers. In its quest to supply labour requirements, INCO hired hundreds of workers from Portugal and Italy, and actively recruited from Newfoundland to British Columbia. However, INCO's policy of not hiring locally (in order to discourage the less attractive elements of society who often turn up in boom towns) meant that Aboriginal people living in the area were systemically excluded from the recruitment process. A person living in the Thompson area would have had to travel by canoe or dogsled to the nearest railway siding, take the train to The Pas, apply (and get hired) for one of the jobs in Thompson, and then take the train back to Thompson. Canadian National Railway Police and RCMP officers checked each person travelling to Thompson for employment papers. Those passengers who could not produce such papers were sent back on the next train heading south.

The northern workforce often faced dislocation and subjection. The social impact was not as severe as that experienced by Aboriginal people because many of the workers were transients who never had the same familial ties to the area. However, the practice in most of the communities has been to allow the major employer (usually a mining company) to control who could build homes in the community. The employees, after paying for years on loans and mortgages, were often left with worthless properties when the mine closed. A few examples include Knee Lake 1936, Gurney Gold 1939, Herb Lake 1944, Sheridon 1954, Wabowden 1978, Lynn Lake 1983, Leaf Rapids 1989, and Snow Lake 1992. The following excerpts are from a September 30, 1937 memorandum from W. B. Paton, Inspector of Mines, to the Deputy Minister of Mines and Natural Resources regarding the townsite at Gurney Gold Mine:

> The potential life of the mine will probably not be a lengthy one. While this fact is not being divulged to employees, at the same time any excessive expenditure consequent on making an open town would not be warranted. In the end it would probably result in considerable loss.
>
> The comparatively isolated location of the mine would, with an open town, lend itself to the introduction of undesirables and "joints". The morale of the camp would be lowered in consequence.
>
> The disadvantage of a closed town is the fact that employees and particularly those married are practically bound to the company. If the company takes advantage of this, the employee has little or no chance to get out without serious loss.

> The management at Gurney is in favour of the closed town but assures me that if an employee were dismissed for any reason, he would not be turned off the property except if he had a bad influence on other employees.
>
> The Gurney mine . . . is a compact and apparently contented little settlement. (Paton 1937:n.p.).

Other correspondence that addressed the situation at Gurney and elsewhere substantiate the claim that the companies and the governments conspired to subjugate the miners and their families (Manitoba Provincial Archives). In many ways, the workers have experienced the same callous treatment as the Aboriginal people in the North have received from various levels of government (Jamieson 1972, Kelly and Kelly 1973). The residents in the railway communities have experienced similar dislocations. The history of northern Manitoba is replete with examples of the systemic exclusion of people of First Nations' ancestry from accessing the goods and services, employment opportunities, or business opportunities. In 1936 the mine manager at God's Lake Gold Mine wrote to J. Lysecki stating that:

> children of employees [attend school] free of charge, but children of non-employees have to pay a fee of $5.00 per month and the Company has the right to refuse admittance to children of non-employees . . . Indians and half-breeds are not admitted. (cited in Sealey 1980:41-42).

While First Nations people were active in the discovery of many of the major ore bodies, laws prevented them from registering claims, and subsequent policies and laws often prevented them from living in the communities that grew up around these ore bodies. Some of the well-documented cases of First Nations people who discovered ore bodies that were registered to non-Aboriginal people include the San Antonio Gold Mine that was discovered by a Cree trapper, Alex Spence, and registered by E.A. Pelletier; the Flin Flon mine that was discovered by a Cree trapper, David Collins, and registered by T. Creighton; the Rex vein at Herb Lake which was discovered by J. Cook (Cook eventually enfranchised and found another ore body which became the Red Rose Claim); and the Cold Lake Mine which was discovered by Phillip Sherlett (a.k.a. Phillip Charlotte) and registered by R. Madole and C. Sherritt (Birse 1946, Cole 1938).

What this history emphasizes is the enormity of the dispossession of northern and Aboriginal people. The five dollars per month mentioned above would have served the same purpose of restricting access for the non-Aboriginal children of working poor in the area as it did the Aboriginal children. As the next section "Transition Year Programs: An Analysis" indicates, even with all the programs currently in place, and the best of intentions in dealing with the groups that have historically been excluded from post-secondary study, these non-participants or their children will likely never even see the inside of a college or university, or remain long if by some chance they do manage to access a post-secondary institute (Levin and Unruh 1990). The social situation of northern Manitobans is analogous to those identified in a report presented at the University of British Columbia in 1984, by Neil Guppy. He stated that:

> Just under 90% of the people born in this province will never get within spitting distance of a university or college . . . the spitting distance is furthest for children born in the homes of the working class. The probability of kids from working class backgrounds going on to attain a university degree is well below that for kids from

> upper class backgrounds (in the order of a 300% difference). And that probability has changed very little through time. . . despite increasing rhetoric concerning equality, over time the educational disparity at the university level between the working class and the upper class has diminished very, very little (cited in Anisef *et al.* 1984:184).

The problem was finding a program that would address the disparate histories of Aboriginal and non-Aboriginal people. A transition year program emerged from the discussions that respected individuals' cultural values and career aspirations, as well as the collective reality of the socio-economic and geographic barriers facing northern peoples.

Transition Year Program: An Analysis

Although a number of individuals had proposed or developed programs over the years, the first step toward something tangible and concrete began only after all the interested parties sat down at the same table. At the end of two days, this collection of northern Aboriginal people, working class representatives, and Aboriginal and non-Aboriginal academics came to the agreement that a Transition Year program must meet the following minimum criteria. The program must have clear indicators that identify "transition" — from what to what. The answer to this question was complex in its simplicity. The simple answer was that the program must adhere to the axiom that *any educational program must begin from where the learner is*. The complexity is inherent in the need to identify the uniqueness of each community and build a program for that community, and a time frame. The transition program must also provide students the opportunity to examine where they are, so that in the course of the transition they do not lose sight of their roots, and experience anomie. The Aboriginal participants were adamant that students must be enrolled in accredited or credit transfer courses, and that they must be afforded the opportunity to learn the skills that would allow them to pursue further studies in any of the disciplines associated with credit courses.

The need for a Transition Year was explicated by one of the First Nations participants at this meeting who reported that of the "twenty-eight high-school graduates who left our community last year [1994/95] to attend university or college, twenty-six were home by Christmas. They either failed out or were unable to stand the loneliness" (Alcorn 1995:n.p.). Other community representatives provided similar examples of well-prepared students who scored in the upper percentiles in Provincial tests, but who were unable to complete their first year of studies outside the community. One of the First Nations school board members stated that "we have become so frustrated seeing bright young students excited about graduating and going on to college and university and then coming home with a sense of failure that from time to time we question whether we should even bother with a high school in our community, given the costs of maintaining a system that can't seem to prepare graduates for further study." (Alcorn 1995:n.p.).

This sense of frustration was exemplified later by one of the participants who stated, in response to the suggestion that the program be developed by a committee of the community representatives, "We don't care who does it. You [KCC and IUN] do it. You're the experts and we need it now." (Alcorn 1995:n.p.). The unfortunate reality is, that in twenty-five to thirty years of delivering programs in the North, neither KCC or IUN has been successful in addressing these transitional problems.

The question of who would be served by the Transition Year was answered by one of the First Nations Education Authority representatives who stated, "We will ensure that every band member we think needs this program, takes this program before proceeding to college or university. We control the funding and we're tired of providing funding to a system that continually fails our students." (Alcorn 1995:n.p.).

Briefly, the Transition Year Program was described as a community-based program of college and university courses structured and delivered so that participants achieve the academic skills and lifeskills to make informed choices about further career options. This, so that participants gain the academic grounding necessary to access the career or profession of their choice, and so that participants realize a sense-of-self which allows them to determine and retain their cultural integrity in the face of an overwhelming barrage of forces leading to a transformation of cultural values.

The question of transition from what to what, became transition from where the students are to any place they want to be — physically, socially, personally, or academically.

The value of these ideals was identified by Highway (1993) and by Vaala (1993) who reported on research arising from a study of Aboriginal students in three community college programs. Vaala stated that "programs that combine career programs with upgrading, rather than requiring upgrading before entry, enhance students' self-esteem" (p. 77).

The academic skills stressed in the Transition Year Program were considered in light of the students' career aspirations and the belief that inherent in each discipline are a number of specific learning strategies. Svensson (1984) argued that general skills — reading, listening, writing, and problem solving — represented the conditions for and parts of learning. He stated that "the quality of learning is dependent upon the quality of skills deployed" (p. 56). He concluded that:

> . . . skill in studying is not equivalent to skill in learning. Moreover, the benefits of skilled learning go beyond a better knowledge of a specific body of subject-matter and its long-term retention and application to new material. Ultimately, improvements in skill in learning which stem from any particular course unit are not specific to the content of that unit. (p. 70)

A further belief was that students' approaches to learning were often dependent upon their beliefs about the subject. Entwistle and Marton (1984) argued that "students develop expertise in learning through building up a wider array of knowledge within their developing organizational and interpretative frameworks" (p. 216) and, further, "meaning has to come from the individuals involved — their own perceptions of what they are doing and why they are doing it" (p. 224).

Although, as Selman (1991) demonstrated, examples of various forms of transition year types of programs are replete throughout the adult education literature, the examples and concepts that provide a grounding for emancipation, empowerment, and the ability to fully exercise one's democratic rights are those founded on the idea that education is not about change but rather about options. This idea of education was encapsulated in Jose Ortega y Gasset's maxim "Whosoever would teach us a truth, let him not tell it, but place us where we can discover it ourselves." (Leake 1974). As one First Nations contributor stated, "We have had all the transformation we can stand. Some white people came here to tell us about God and others came here to be God and

re-form us in their image." (Alcorn 1995:n.p.). She may have added, as some of the authors who write from a feminist perspective, that the idea that women have to "transform" is repugnant.

Conclusion

For northerners, there are some major ties between transition programs and the field of adult education. The most significant tie is the fact that many northerners of both Aboriginal and non-Aboriginal ancestry do not enter post-secondary studies until well into their adult years. As non-sequential students (i.e., not entering post-secondary directly from high school) and as northerners, they often face a double jeopardy in attempting to access university or college. They are especially suited for transition year programs as they must make the transitions from work to academe and from an adult role to a student role, as well as the other transitions identified throughout this study.

An education counsellor from one of the communities that participated in the early discussion presented a conceptual model of the growth an individual might go through in a transition. In reflection, perhaps Osborne's *transition tree* is the perfect metaphor for the Transition Year Program that has been presented here. It has been argued throughout that the program should have solid roots in the culture of the participants, that it should be about providing choices, and that changes were about branching out, but retaining one's original form, and being able to return to where one began. A tree, that changes through the seasons, returns again and again to its former self. The tree learns to live in its environment, even when that environment changes each season. The tree continually puts down roots while, at the same time, breaking new ground and branching out. The Transition Year Program developed by northerners, for northerners, provides students with an opportunity to branch out into new areas of education.

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Nanabosho: Weaving The Dream Into The Classroom

Joe McLellan[1]

When I refer to Nanabosho, I am speaking of the Manitou who was sent by the creator to protect and instruct the Anishinabek (the Ojibway). I am speaking of the Manitou whose actions have been carefully documented in the oral tradition of the Anishinabek.

In this tradition, Nanabosho reveals firstly to the Anishinabek and now to all peoples, the workings of both this world and the world of the Manitous. These revelations take on the shape and importance for Anishinabek that the Bible has to those who belong to the Judo-Christian tradition.

We live in, and relate to, a "real" world in which we see, touch, feel, and smell. In this world a rose is always a rose but things change in an ordered cyclical way. We categorize things using logic and call it all "reality". In the Anishinabek world, there exists a world of the Manitou (Therriault 1986). It is not 'off there' in the distance or 'way up' somewhere. It is in the same place as our physical "real" world. We are just not always in touch with it. The Manitou world is beyond our worldly logic. A rose is only maybe a rose. Things change in ways that are surprising. Manitous affect the outcome of things in mysterious ways. The ordinary logic of reality is transcended.

The stories of Nanabosho helped Anishinabek place themselves in the world in relation to their creator, the Manitou world, the land, their community, and themselves. The task of the storyteller is to weave this body of knowledge into the lives of the listeners. In this way a person learns that life is made up of both reality and mystery.

To Anishinabek, learning is done both in the mind and the heart (Therriault 1989, Tafoya 1984, Bonaise 1980). Let us assume that the mind represents reality and the heart represents mystery.

> A story is not a cold bundle of facts to be committed to memory, it goes straight to the heart. You may not remember it right away. It goes around in circles in your heart and mixes with the wisdom you have been given by your elders, your grandparents, your parents. It mixes with your thoughts, lines from songs, the words of your friends and loved ones. You forget the voices of the tellers and one day when you need it the most it comes out in your voice and you are the teller (Tafoya 1984).

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The following story of Nanabosho is told in order to introduce the reader to the Anishinabek world, to our whole being, our physical, emotional, spiritual, and intellectual being.

It is said that a long time ago, there was a woman named Nokomis (grandmother), who with her husband lived on the moon. Everyday she would look out into space and admire a small green ball. "I wish to go there." she thought. With that wish, she was lowered to what we call Mother Earth. It was beautiful. The only problem was that she could not return to her husband on the moon. She was with child. She settled on this earth and eventually had a beautiful daughter which she named Winona.

Winona was a well behaved young girl and always listened to her mother. She learned how to survive on this earth, how to do the hard work required of her.

One day, Nokomis heard that the West Wind was looking for a wife. This concerned her because she knew the West Wind to be very rough and harsh and became afraid that he might take Winona away with him.

My daughter" she said, "whenever you sit by the fire, never face the West, because I do not wish the West Wind to ever see you."

Winona always obeyed her mother, but one day as she was making a porcupine quill pattern on a pair of new moccasins, she forgot and sat by the fire facing West.

Later that day the West wind happened by and saw Winona. He was struck by her beauty, he grabbed her and hurried her away to a cave in the far off mountains to become his wife.

When Nokomis came to the fire she found her daughter missing and searched for her everywhere. Finally an eagle tired of hearing her calling out Winona's name, came to her and said, "Old woman, your daughter has been taken away by the West Wind."

"I can not match his power," Nokomis thought as she returned to her fire.

For a while, Winona lived with the West Wind and also tended to his brothers The East, South and North Winds. Eventually she tidied up the cave. They came home and blew everything around again. She longed for her mother and her beautiful land by the lake. Finally, Winona left the cave and the West Wind behind. She was expecting a child and wished to be with her mother.

One evening as Nokomis sat by her fire she thought she was being called, but in a whisper *Nokomis, ni tetaam* (my mother, or more exactly, "the centre of my heart").

At first, she thought it was only a bird calling in the distance or a trick of the wind. But when she looked to the West, she saw Winona coming slowly toward her. She ran and took her daughter in her arms.

I am so glad to see you" Nokomis said.

"All of this time I have been away, I thought of you and our beautiful land. I have come home to have my child here, away from his father who scares me so. I am so tired, I must lay down.

Nokomis led her to the lake and helped her lie down comfortably. Later that night, Winona gave birth to two boys. She was so exhausted from her journey that this effort was too great and she passed on to the land of the Manitous. One of the baby boys was healthy and cried loudly while the other was weak and died shortly afterward.

Nokomis was so saddened by the death that she couldn't think straight. She took the living baby and wrapped him in moss and soft grass and placed a wooden bowl over him to keep the animals away.

She then went off to the woods where she grieved for four days before burying

the bodies of her daughter and her grandson.

Later, on the fourth day, as she was working away the grief from her hair she thought, "Oh, No! I have forgotten the living baby. He must be starving."

Quickly, she ran back to her camp where she had left the baby. When she found the bowl it was overturned. The baby was gone.

"I have grieved too long," cried Nokomis, "and now something has happened to the baby."

As she sat, full of new sorrow, she noticed a small white rabbit eating grass. She picked it up and began to pet it.

"Nokomis," said the rabbit, to her great surprise, "do you not know me? I am your grandson, Nanabosho." With that, the little rabbit changed into her grandson Nanabosho. Nokomis knew then, that her grandson was a powerful Manitou who had changed himself into a rabbit because he had become so hungry.

When the birds and the animals heard his name, they traveled the earth. Telling every living thing that a great Manitou named Nanabosho now walks the earth. Very rapidly the son of the West Wind and grandson of Nokomis grew and learned of the world around him.

From that day on, Nanabosho, who could change himself into anything imaginable, became a great teacher of the Anishinabek in their beautiful homeland (McLellan 1989).

It is important to note that although this story tells of the birth of Nanabosho, it is part of the cycle of Nanabosho stories and though it is a convenient port of entry to the cycle it is not the only one. Many storytellers choose to start with the story of Nanabosho and the Flood which tells about how Nanabosho survives the flood and with the help of especially Muskrat, the world is reborn into Turtle Island. Why begin the cycle here? That's part of the mystery.

We can see through this story how the whole of our being is addressed as the story speaks to our physical, emotional, intellectual, and spiritual selves. Physical growth and limitations are considered in the part of the story dealing with the birth of Winona, the adolescent Winona forgetting then moving into a marriage, becoming pregnant and then giving birth and dying.

Emotionally we are given model images of loss, grief, partnership, mother/daughter relationships, abandonment, change and joy to incorporate into our reality. We are challenged and confronted with the intellectual meanings of life, death, the role of nature in our lives throughout the story. The story also speaks to us of spirituality. Information is given on the relationship between the Manitou world and our reality, the workings of God in our world, our sense of surrender and meaning of life.

When I was asked to put the Nanabosho stories into print, I balked at first. I had only known the stories as a part of oral tradition and was not sure if the stories should be written. I decided to consult elders, so I took tobacco to elders and asked them if they thought it would be appropriate to write these stories in a book. The elders that I consulted were, Paul Huntinghawk, Way-way-see-cappo Reserve, Manitoba; Herman Atkinson, Roseau River Reserve, Manitoba; Alex Skead, Muskrat Portage Reserve, Ontario; and, Joe Therriault of Ombabika, Ontario. I was told that although it was up to me to do what I decided to do, they felt that it was a good idea. Herman Atkinson (1984) told me that at one time a person could gather all of their grandchildren in one room and tell them stories. Now, that is difficult because ones' grandchildren live all

over the world, not just in one place. Joe Therriault (1986) thought that it was a good idea to record the stories because he stopped telling stories when nobody seemed to be listening, that people had lost their language. He thought that these stories might help Anishinabek children understand who they are when they read these stories in school.

However, although stories can be written they are best when 'wet with breath' (told) (Tafoya 1983). My concern with recording stories, especially the Nanabosho cycle, is that they are part of the Indigenous fund of knowledge. Anishinabek need to know this knowledge in order to grow in physical, emotional, intellectual and spiritual balance. They also contain the knowledge that all who choose to live, here in this place, need.

This is why I believe that stories, especially Aboriginal stories, belong in classrooms as an integral part of the total curriculum. The stories show both Anishinabek and other children what they need to hold in their heads and their hearts to live here together. A storyteller will open the door of reality and lead them with Nanabosho through the Manitou world so they may weave what they learn into the fabric of their everyday lives.

I conclude with the words of an Ojibway/Cree woman, who is also my wife.

> "Tell them that the stories are important. Our little children need to know them. When I was little we were told the stories in our language and the stories meant more because our language was more precise, more to the point of the story. Our language grew in this land and knew how to speak of it."
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> "People can use our Nanabosho stories to help everyone. People can make up their own. We always did because it was important to teach the children about survival and life" (McLellan 1997).

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III. ECONOMIC, ENVIRONMENTAL, POLITICAL, AND CULTURAL ISSUES

Environment, Economy and Culture: The Sustainability of Rocky Cree Traditional Tanning

Bret Nickels[1]

Introduction

Sustainable development in the Canadian north implies a central focus on economics; however, it involves people, societies, and cultures as they function in natural environments. What many people in the north are seeking in terms of sustainable development, is the sustainability of human livelihoods as they depend on, and intimately interrelate with, natural systems.

The concept of livelihood relates to "a means of living or supporting life and meeting individual and community needs"...sustainable livelihoods are "based on a web of functional interrelationships in which every member of the system is needed and participates" (North American Regional Consultation on Sustainable Livelihoods 1995).

Sustainable livelihoods are characterized essentially by a state of balance, maintained over specific periods of time. These are difficult to measure, since the 'state' is a quality of motion rather than a fixed point. As with an airborne kite or a moving metronome, many different forces can act simultaneously to create an equilibrium; if one is modified or abandoned, others become dominant. Sustainable livelihoods can only be achieved when all forces contributing to the balance are 'in sync'.

In any society, economic system, or livelihood, there can be many forces or influences on sustainability, such as the size of a resource, economic inputs and outputs, and pressures on an environment, such as pollution. Some of these are controlled within the system, while others are subject to outside pressures. Sustainable livelihoods, are dramatically influenced by a myriad of forces — cultural, environmental, and economic in nature. Since most systems are complex and not well understood, cause and effect relationships are not always apparent. The challenge is to find simple ways of describing sustainability despite the complexity and uncertainty. For northern Aboriginal communities, the challenge is to develop strategies that consider, accommodate, and integrate environmental, economic, and social realities (Jackson 1987).

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Rocky Cree tanning (sometimes referred to as skin preparation) in Nelson House First Nation represents Aboriginal tradition for certain members of the community. This community activity fulfills and is supported by a tradition of policies that enable mutually-beneficial relationships to develop among individuals and the whole community. Since this traditional activity is dependent on, it is also dramatically influenced by a myriad of cultural, economic, and environmental forces. This paper illustrates how such forces affect the Rocky Cree tanning industry and how the interrelationships between them influence the sustainability of this means of a livelihood. The first objective of this study is to identify the factors influencing traditional tanning; the second is to ascertain the sustainability of Rocky Cree tanning in Nelson House based on those identified influences. Nelson House is located in a glacial lake plain of the Precambrian Shield of northern Manitoba's Footprint River Basin on Footprint Lake. It is approximately 64 km west of Thompson and 10 km south of Provincial Highway 391.

Methods

Ethnographic methods, including informal interviews and participatory models, e.g., participating in and observing operations, were used to produce a detailed description of the various tools and tanning processes used by Rocky Cree at Nelson House (Nickels 1997). Tanning operations and procedures were analysed to determine environmental, economic and cultural influences. Tanning is the first important process used in the construction of traditional items such as moccasins, gauntlets, jackets, drums and tobacco pouches. "Without some form of preparation, the skin would be too stiff, fragile and prone to rotting to be of any use to a clothing maker...once a hide has been tanned it can be used to make any type of traditional clothing" (Dumas 1996).

Background - Factors Affecting the Sustainability Tanning Operations

Environmental — Tanning is directly affected by weather, terrain, availability of moose skins, of a work area and of required forest materials, temperature, precipitation, sunlight, wind, humidity, and time of year (Nickels 1997). These factors determine soaking duration, drying time and skin condition, and ultimately, the ability of a tanner to produce a final product. These factors also influence decisions on when to begin or complete certain steps, as well as the choice of tools used.

The availability of moose skins is a primary factor influencing the skin preparation. Not all tanners have relatives who are hunters, and those who do hunt, even on a regular basis, do not always harvest moose every year. Some hunters are more proficient than others and moose populations fluctuate from year to year. As a result, skin preparers are dependent upon the relative skill of the hunter, as well as healthy moose populations to procure skins for the tanning process. Some skin preparers have continued access to moose hides, while others have only occasional access or are dependent on the distribution of hides by hunters. Long-term planning is therefore almost impossible because of this dependency on the availability of moose hides in any given year.

The age and size of moose skins are considerations, as are the size and intended use of each hide. For example, tanners prefer young moose skins for moccasins because older skins are usually harder to scrape. Similarly, smaller skins are often preferred over larger ones because they are usually easier to work with, requiring smaller frames and thus are easier to lift when stretching and drying.

Skin preparation requires the tanner to procure or make tools, and gather materials such as poles for stretching frames. The quality of the product is dependent on the

tanner's ability to de-flesh, de-hair, scrape the skins evenly, stretch and dry the skins carefully, and smoke the skins without scorching the hide. Physical space and strength are needed to accomplish these tasks.

A suitable flat working area, adequate storage facilities, and a water supply influence the feasibility of skin preparation. Materials such as charred wood, old toboggans, old chain saws and other scrap metals, and moose bones are needed to produce the tools used in skin preparation. Many traditional stone and bone tools, which were difficult to make and use, have been substituted with more effective steel tools, making tanning easier.

Resource extraction activities have had negative impacts on the environment from which many tanners procure their materials and tools. Local developments such as the Churchill-Nelson Rivers Hydro Diversion Project, have destroyed a number of prime diamond willow groves, from which tanners used to have easy access to a steady supply of wood used in the smoking process. Proposed forestry operations by Repap (a lumbering company that holds license to much of the land) threaten to disrupt moose populations. Forest fire management plans also threaten to interrupt the vital 20-year fire cycle from which are produced the ideal poles for frame construction.

Economic— Economic factors such as wage employment, supply, demand and market value of traditionally tanned items, cost of tools and materials, competition from commercial tanning companies, and friction between multinational industries and traditional tanning operations have had an important impact on traditional Rocky Cree tanning.

Wage employment has reduced the interest level and the time available to dedicate to tanning activities since many potential tanners are now involved in wage-related work. There is often more money to be made from wage-related work, thus reducing the monetary motivation of tanning. Comments like: "I make more money doing my secretarial duties at the Band office than I would tanning, so why would I tan hides?" (Wood 1996), are common. However, many women suppliers of tanned materials still have few opportunities to earn money, so they continue to prepare skins to obtain at least a little economic advantage. Those with few marketable skills in wage-related work and those unable to find work in wage-related activities find some economic advantage to learning and acquiring skills as a tanner.

Skin preparation is a difficult, time consuming, and labour-intensive process. It has been suggested that if one were to calculate the process according to an hourly wage, "it would only be a few cents an hour" (Moore 1995). Tanning is not always considered a lucrative economic endeavour, despite the fact that a non-smoked, scraped hide can realize up to $1000 from dealers in the United States (Dumas 1996). Many new tanners feel skin preparation is not worth the effort.

The cost of tools and materials is also a consideration. Some tools, such as fleshers, are cheap and easy to manufacture; others, such as knives and sidelines used to fasten hides to frames are more expensive and not always easy to procure. The availability of tools affects the efficiency and economic possibility of completing the work, especially for those wishing to become first-time tanners.

The variability of price and demand for traditionally tanned items is also an important factor. Dumas (1996) stated that "traditionally tanned articles are priced, in a manner typical of homemade piecework throughout the world, at a point on the demand curve expressed by a very inelastic supply and a very elastic demand." This is

substantiated by King (1991) who maintains that this is true for many Aboriginal clothing producers in the subarctic regions of Canada. The variable supply of moose to a tanner affects planning and pricing; however, the demand for traditionally tanned hides is fairly constant. As a result, a tanner cannot make long-term tanning plans and this directly affects the cost of finished products such as moccasins.

Finished hides which are later sewn into moccasins must be priced to compete in the market with finished moccasins produced by manufacturers in the south. Cheaper labour and less expensive commercial tanning processes allow southern manufacturers or foreign companies to produce cheaper and more widely-available products, especially moccasins. Most Nelson House moccasin assemblers sell, barter or trade their products with Aboriginal people from surrounding communities or to non-Aboriginal people visiting Nelson House, rather than to stores.

The greatest economic impact on traditional Rocky Cree skin operations has been from commercial tanning companies based in Winnipeg. Though these companies are unable to produce hides that compare in quality or durability with traditionally tanned hides, they can nevertheless create a finished product that is cheaper and adequate enough to produce garments such as moccasins. Most seamstresses prefer traditionally-prepared skins but, the attraction of procuring a cheaper hide that does not require the time-consuming, arduous traditional processing is attractive to many, which affects a tanner's motivation to produce traditional-tanned hides. It also affects the pricing structure as moccasins made from commercial hides are cheaper to make and, therefore, can be priced at a lower cost. Many seamstresses who make products exclusively from traditionally- prepared hides attempt to compete with those manufactured commercially by lowering their price, and often lose money in the process. This has set an artificially low price for traditionally-prepared moccasins and many seamstresses find it difficult to justify the time and effort put into traditional products. Rocky Cree products such as moccasins can be bought from a variety of retail outlets. The greatest volume, but least specialized products are sold in shops in urban metropolitan centres (King 1991), such as the Arctic Trading Post in the Hudson's Bay Co. (Winnipeg), the Winnipeg Fur Exchange, St. Regis Hotel Craft Shop (Winnipeg), Shagnapi (Winnipeg), and those identified by King (1991), mainly Snow Goose (Ottawa), and a number of shops on Fort Street (Victoria), and in Gas Town (Vancouver). These shops sell large quantities of moccasins (often made from commercially-tanned hides by unidentified individuals in unidentified communities). It is extremely rare to find Nelson House moccasins made from traditionally-prepared hides for sale at these outlets, as there is no organized marketing carried out between these shops and the community. Nelson House does not have a co-op where they sell traditional craft items or a marketing centre for traditional Rocky Cree moccasins. Neither does the Nelson House Economic Development Corporation offer programs to aid tanners and seamstresses as they do for fishers and trappers. The only external markets are the Northern Store Trading Post and the Arctic Trading Post in Thompson (which supply traditional craft materials to both local people and tourists), and the Northern Store in Nelson House. Other opportunities for sale are craft shows at local festivals, through family or community individuals, or through word of mouth to tourists, researchers, workers from the south, and other 'outsiders'. Nelson House tanners and seamstresses often find that only local outlets will market products made from traditionally-prepared hides, thus the demand for such materials is limited.

Cultural — Cultural factors such as the skin preparer's personality, physical health, community involvement, age, education, family, role models, exposure to traditional ways, and exposure to southern role models influences traditional tanning techniques/processes. Tanning is usually learned from relatives (generally from mothers or grandmothers), yet each tanner's hides are produced with distinct and individual qualities. Community members can often identify a tanner by scrutinizing the look and feel of the finished product. Each tanner uses techniques borrowed from other skin preparers, and then their own, creating a personalized process that produces a unique hide. When a new tanner is influenced by someone who has their hides commercially tanned, they will also likely have their hides commercially tanned, and are less likely to attempt traditional tanning.

Gender and family composition affect the number of finished hides produced. Traditionally, women directed the tanning process, and did most of the primary work on the hide. Men made the tools, gathered the various materials such as poles used for stretching frames, and helped with some of the more physically-demanding steps such as stretching the hide, constructing the frame, and scraping the hide. Conflicts or arguments between men and women were minimal because of this division of labour. This balance in gender roles was important for maintaining an efficient enterprise (Moore 1995). Today, men are far more involved in skin preparation; and an upset in balance can affect the number of hides produced and the time spent preparing a hide.

The change in gender-based roles has also affected general interest in skin preparation enterprises. Although traditional tanning is still considered a woman's pursuit, Cree men are increasingly interested in traditional tanning techniques. This sudden curiosity has become widespread among [male] wage earners, who regularly take part in other traditional pursuits (such as hunting, fishing, trapping and gathering medicines) and who have the money to start such an enterprise. The attraction of extra income, a desire to learn another aspect of traditional Cree knowledge, and a need for recreation are all motivating factors in their pursuit (Dumas 1996).

Traditional skills such as skin preparation are greatly affected by a change in role models. Women and men who grew up "on the land" often patterned themselves after their elders (Dumas 1996). Those who grew up in communities were often exposed to southern role models such as teachers, nurses, TV heroes, sports stars, and music personalities unfamiliar with traditional livelihoods such as tanning. This lack of role models provides little encouragement for younger people to develop traditional skills, and has deterred many potential skin preparers who are more tempted by their southern role models' lifestyles.

The method of teaching tanning techniques has also changed. Traditionally, a girl was taught by her mother, grandmother or an experienced elder, who waited until she was interested in learning the techniques. The girl would be expected to watch the tanning of a number of skins. Once it was felt that she had observed and learned basic techniques, she was allowed to try tanning a skin on her own. When problems or obstacles arose, the teacher worked on the difficult area and then expected the girl to continue. As a result, the first tanned hide was often good enough to be used for moccasins.

The new education system restricts the emphasis on learning traditional activities such as tanning. Children educated in urban off-reserve communities, such as Thompson or Winnipeg, seldom learned how to prepare hides until they return to their community. Off-reserve schools do not provide the teachers, materials, or time needed

to learn traditional techniques. For example, in the summer, many students return from off-reserve schools to Nelson House. Skin preparation is not always completed in the summer, so those students rarely get an opportunity to learn the whole process. The Nelson House school, however, introduces skin preparation techniques to students as part of the curriculum. Students are brought to the camp of an experienced tanner who demonstrates each step in the process. The students then get a chance to work on each step of the process under the guidance of the tanner. William Dumas (1996) admitted that "it would be better if we had enough hides... and time to allow each student to work on their own hides in order for students to learn the process and feel a sense of pride and ownership in their work".

Additional instruction will be needed before students are able to tan hides on their own, but the program may not be continued. As a result, the teaching of traditional skin preparation techniques in Nelson House is tenuous, and its effectiveness in providing youths with an understanding and an interest in traditional tanning techniques has not been determined. The school hopes that some students will either practice tanning hides on their own, or become interested enough to apprentice with an established tanner.

Two community members have proposed to teach tanning at a camp open all year to both tourists and residents. A variety of traditional skills, including moose skin preparation, would be taught to Cree students using traditional teaching methods and hands-on experience. Hands-on experience is considered by many tanners to be the best way to learn traditional skin preparation. Cost estimates for the camp, and an appropriate site are being considered. The plan calls for "the camp to be open within a few years" (Dumas 1996).

Social events, such as Nelson House Otowhowin Summer Festivals, the Cross Lake Indian Days, and the Norway House York Boat Days host competitions for traditional skin preparation and moccasin production. Women from Nelson House often enter their finest articles into the competitions, including moccasins made from traditionally-tanned hides. These events have created a great incentive for tanners at craft shows that are a part of these festivals. Many tanners also set up booths to sell their traditional moccasins, and is one of the largest outlets for the sale of traditionally-prepared moccasins.

A person's age often determines whether they will become a tanner. Those between 30 and 60 are the active tanners today, since generally those born before the 1970s were old enough to learn skin preparation from family members, whereas those born later rarely had the opportunity to see tanning performed. Some younger people may acquire the skills when they get older, whether or not they participated as a child, but it may be that such skills are not of interest to the young. Often, it is not until people with the skills are gone, that others desire to learn, as is evident with many adults, particularly men, who expressed an interest in tanning long after relatives had passed away.

Strong arms, agile hands, and energy are needed to prepare skins. Tanners with low physical strength, low energy, failing eyesight, and general poor health often have difficulty tanning skins traditionally, and tend to have their hides sent to Winnipeg to be tanned commercially. Even though this is sometimes more expensive, it saves them the arduous task of tanning the hides themselves.

Sustainable Development — Renewed interest in traditional knowledge systems by both researchers and the Indigenous population is inspired by the need for sustainable livelihoods, cultural survival, and the need to, symbolically at least, re-identify with

Mother Earth. Traditional tanning processes have received less attention than other traditionally-based activities and systems such as traditional plant use, music, or dancing. However, a knowledge of all traditional practices, including such activities as skin preparation techniques, will be required to ensure that a holistic, balanced perspective is available for future generations of any culture.

The traditional belief systems and practices observed by Indigenous peoples exemplify ideals, values and technologies which are increasingly relevant to modern concepts of sustainable development and the maintenance of subsistence economies (Jackson 1987). Lifestyles based on such livelihoods as tanning are important in the maintenance of subsistence economies and the development of new economic endeavours that are dependant on a renewable resource base. The current economic rewards of tanning operations are small, but without them many tanners in communities such as Nelson House would be destitute, and there is still the potential for many others to benefit.

Many aboriginal youth have rejected traditionally-based activities or are unable to learn from their elders due to schooling, jobs or other cultural, environmental or economic restrictions. As a result, much of the traditional knowledge associated with these activities is in danger of being lost. Despite the rejection of traditional systems by some Aboriginals, others seek to secure and publicize traditional knowledge in support of the land claims and for cultural survival. The cultural importance of traditional pursuits such as tanning is gradually being understood by Aboriginal people and academics alike. Clarkson *et al.* (1992) view traditional knowledge systems as a precious resource that teach how to live on the land in an ecologically and socially sustainable way. Traditional knowledge is also acknowledged and its pursuit encouraged by Aboriginal leaders as a means of returning to traditional values and culture. Payne and Nepinak (1996) report that when traditional knowledge systems disappear, traditional cultures are replaced by new cultures — characterized by poverty and dependence. Aboriginal people use their traditional knowledge to provide insight and direction into environmental, economic, and cultural issues that relate to sustainable livelihoods.

It is imperative that traditional knowledge related to Rocky Cree tanning processes be understood and shared so that this important aspect of Indigenous knowledge is not lost. Traditional tanning is the basis for the traditional craft and clothing economy of the Rocky Cree, which can culturally exemplify a Rocky Cree "way of doing things" (Dumas 1996). This "way of knowing" help the young find their place within their world. Without such a connection to traditional ways, many of Nelson House youth will be in danger of falling into the cultural morass in which many Aboriginal people find themselves. Presently there is great desire among some community members in Nelson House to learn the traditional ways and find a connection to their cultural identity, history, and "way of doing things". Perhaps they will discover that traditional tanning is one way to fulfill this desire.

Conclusions

It is evident that a variety of environmental, economic, and cultural factors have greatly impacted the success and future viability of traditional Rocky Cree tanning. These factors influence each tanner individually, and the sustainability of tanning as a livelihood. For instance, skin preparation is practiced by older people within the community. Despite the community's efforts, particularly in schools, the tradition is not being continued by the young, who do not see tanning as a lucrative endeavour, or

find tanning less than desirable. This may not bode well for the continuance of skin preparation tradition in places such as Nelson House.

Environmental factors have impacted the industry as well. Hunting, hydro development, and pollution have affected the flora and fauna required for the industry to remain sustainable. Strategies for harvesting, resource development and management will be required in the future if this activity is to remain sustainable.

Economic considerations are also important to the continuation of a viable traditional tanning operation. For instance, commercial tanning operations provide a less expensive alternative. Prices and markets are also not well defined. Competition from commercial leather clothing manufacturers is also a threat as these operations begin to produce specialty items such as beaded jackets, moccasins and gauntlets — once the exclusive domain of Native preparers. Finally, the labour-intensive nature of traditional tanning is sometimes felt, by certain members of the community — particularly the young — to be "frustrating and not worth the time and money" (Moore 1995).

In the last two decades, there have been many changes in the physical, social and economic environment of the Nelson House region. Traditional tanning methods have adapted to a certain degree, but many influences have the potential to hinder the sustainability of this traditional means of a livelihood. If a balance could be found, traditional skin tanning could provide the basis for a small sustainable operations which could enhance the economy of the community as a whole.

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Sustainable Development and Aboriginal Communities: What Is The Fit?

Wanda Wuttunee[1]

In the few thousands of years of human existence on this planet Mother Earth, the human family has maintained a relationship with the environment. For many cultures, the idea of direct connection between all living and non-living things from a spiritual perspective has permeated their histories from time immemorial. In other cultures it is the idea of dominion over all living things that makes them regard all living and non-living things as tools used to meet their needs, without particular regard to natural limits. An inherent diversity of experience within the human family, of course, means that between these two extremes there exist every possible permutation of relationship with Mother Earth; and these are constantly shifting in significance.

Today, our connections to Mother Earth continue in one form or other. It is difficult to make generalizations about relationships because there are always many exceptions. For example:

- Indigenous cultures are often characterized by a special connection to Mother Earth, which perhaps does not acknowledge the full impact that colonization and urbanization has on Indigenous people;
- "big business" is said to be uncaring regarding the impact of their resource development policies on the environment, yet some major corporations are taking steps to change the way business interacts with the environment (e.g., *The Body Shop*); and,
- there seems to be no move to curb consumerism in modern society and yet there is a healthy, growing movement among all sectors of society to change harmful decisions through the impetus of environmental groups, mothers' groups, families, businesses, the scientific community, and world governments.

One of the key concepts for those who are concerned about Mother Earth is that of "sustainable development". What is sustainable development, why is it important, and in particular how do Indigenous people, particularly Aboriginal people in Canada, view sustainable development? How might communities that are interested in development take a sustainable approach to determining development policy and strategy? This paper

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explores several approaches to sustainable development and sustainable livelihoods, drawing from theoretical developments and the author's personal descriptions and reflections.

Background

What is Sustainable Development?

While the idea of achieving balance in all things is not new, the idea of achieving balance in renewable resource use was introduced more recently by the World Commission on Environment and Development, better known as 'The Brundtland Commission'. In a 1987 report, the commission issues a challenge to the world, calling for "development that meets the needs of the present generation without comprising the needs of future generations" (Serageldin 1993: 7); the central promise of "sustainable development".

Other definitions of sustainable development have since emerged, reflecting interest from a wide variety of academic disciplines and philosophies. For some, it involves "a process that does not carry the seeds of its own destruction." This means that a development process will continue to meet three sets of criteria over time: economic feasibility, ecological supportability, and social acceptability (Weeden 1989: 43). Weeden defines sustainable development more precisely, stipulating that the best development strategies incorporate the least possible environmental disturbance by:

- matching natural flows and processes as closely as possible,
- providing a significant safety margin to avoid exploitation,
- fine-tuning approaches to local environments,
- using simple technology, and
- maximizing flexibility and mobility in targets of time, space, and resource use (Weedon 1971).

There are on-going debates on issues regarding the theory of sustainability and sustainable development (Dovers and Handmer 1993, Lélé 1991) because sustainable development is a process that is still poorly defined and laden with contradictions (Dovers and Handmer 1993). For example, how can on-going economic growth be possible when such growth constantly pushes ecological limits? What development choices can be made that will not deny today's generation their needs in anticipation of the needs of future generations? How are individual and collective rights and interests to be effectively balanced? These are difficult questions that make fundamental change in world development policies all the more crucial.

Other authors caution that a simplistic approach to the relationship between poverty alleviation and environmental degradation must be considered (Lélé 1991). What is the real place of economic growth within a sustainable development strategy, especially for those Third World countries that are striving to change living conditions significantly? Decision-makers who push for sustainable development are cautioned to consider where equity and social justice fit into their plans. Is there flexibility for different forms of ecological and social sustainability and different notions of equity and social justice? Is there a chance for real participation by all stakeholders in the process? This participation may be in decision-making, implementation of sustainable development strategies, benefit distribution, and/or evaluation (Lélé 1991).

A basic shift in our understanding of our relationship with Mother Earth is critical to the issue. People from all walks of life throughout the world are rising to the challenge in different ways. Whether or not the foregoing issues will ever be satisfactorily

addressed, the fact remains that our future is threatened. The quality of life for our children and our children's children rests in the hands of this generation. The choices we make regarding resource use will have an everlasting impact. It is an enormous responsibility, and one that must account for the real limits of the natural world and our continuing place within it, despite the challenges that acknowledging those limits might bring (Robinson *et al.* 1990).

Why is Sustainable Development an Issue?

What impact will our decisions have for the future of our children? This is a critical question for those who have turned their focus to sustainable development. For Aboriginal people, the links with the environment are strong because of a history of relating with Mother Earth, which was critical to survival. Harvesting food sources for subsistence required being respectful of the natural cycles and limitations of such resources. It is difficult to make an analogy that applies to Aboriginal people who live in a contemporary world. Survival is still critical, but the means of surviving have changed. In Canada, for example, 65% of Aboriginal people live in an urban setting and no longer rely on the land for survival. Even those living in rural areas do not rely solely on the land anymore.

At the 1992 Earth Summit in Rio de Janeiro, several important realities surrounding the need for sustainable development were brought to light:

- "Without better environmental stewardship, development will be undermined and without accelerated development in poor countries, environmental policies will fail."
- "Rio was a signal to the world that after decades of pitting environmental quality against economic growth, policy makers are finally becoming aware of the crucial and potentially positive link between the two."
- "Humanity must learn to live within the limitations of the physical environment as both a provider of inputs and a "sink" for waste" (Serageldin 1993).

Many approaches have been debated, and some put into practice, in attempts to effectively meet the challenge of sustainable development. Several approaches will be briefly described in the next section, which include the World Bank's perspective on sustainable development and an introduction to important, relevant values held by some Aboriginal communities.

Making Sustainable Development A Reality

Many strategies are being employed throughout the world to address the goals of sustainable development. The World Bank fosters balance in sustainable development policy formation by integrating strategies based on economics, ecology and sociology and striving for a holistic approach that addresses most needs. (For some, there is a need to incorporate a spiritual dimension if sustainable development is to become a reality.) These three components contribute to advancing strategies for dealing with the various policy issues facing the world's nations. For example:

economics

- valuation questions regarding the environment, use and non-use of resources, of sustainability for inclusion in national accounting;

ecology

- policies for environmental impacts assessments, balancing human activity and ecological processes, prioritizing biodiversity; and

sociology

- the adoption of a participatory process for setting priorities, balancing promotion of economic growth with improved environmental stewardship and sanctions for damaging the environment, and building capacity for development and implementation of these policies (Serageldin 1993).

Economic growth is the over-riding objective for most countries; however, it is being considered increasingly in the context of sustainable options. Policy-makers are trying to balance economic growth with preservation of economic, ecological, and sociocultural assets, while at the same time protect the poor and ensure a safety margin to meet basic needs (Munasinghe 1993).

Ecologists are moving to 'partner' with economists because they acknowledge the strength of such a union. An integrated approach to sustainable development considers the cost-benefit of managing environmental assets against the cost-benefit of economic growth. An assessment of possible and actual impacts of a development project upon the environment is essential, but difficult since performance measures for environmental and natural resource management strategies are still evolving (Rees 1993). The partnership however, makes sense in the long-term for successfully implementing a holistic approach to development policies.

Policies must be developed with input from all stakeholders, so that the necessary support for successful implementation is in place. Sociologists can contribute strategies that will help in developing socially-acceptable options for the management of resources. Investment in human capital is the third component of the World Bank's triad and has far-reaching implications. Support can be gained through a variety of means including public awareness, participation in co-management authority, incentive systems and institutional controls, use of tradition, empowerment, changing conventions, and promoting trust, solidarity and group-held values (Cernea 1993).

Some debate exists regarding the place of the human element in this triad approach to sustainable development. "The debate focuses especially on those components which are not commonly measured, such as the cultural and historical issues of the preservation and sustenance of cultural and community structures and values. It is precisely these issues, of course, which are at the heart of "sustainability" for Canada's First Nations" (Barg *et al.* 1997).

Some authors question how the fundamental structure of modern society can fit in the context of sustainable development. For example, a spiritual element is recognized as being as important as each of the elements identified in the sustainable development triad recognized by the World Bank (Ghostkeeper 1996, Weeden 1989). The secular approach underlying economic development — of making a living *off* the land — shifts to a spiritual one of living *with* the land (Ghostkeeper 1996).

Respect for Mother Earth and a spiritual connection to the land are fundamental concepts held by many cultures. For some, the relationship between development and

sustainability is articulated in terms of an exchange of sacred gifts. Weeden (1989) maintains that development must involve giving.

> The act of giving creates community and demands relatedness in a way that the market can never do. The value of a gift inheres in the commitment of the giver and receptiveness of the receiver, and is not usefully measured by its monetary value. What this means is that the fundamental act of meaningful exchange is as much within the grasp of the poor as the rich, the labourer as the intellectual.

There are some similarities between Weeden's position and Ghostkeeper's discourse in which he examines the spiritual reawakening of some Métis in his community of Paddle Prairie in Northern Alberta. A change in the pattern of existence is examined — that is, a move from a livelihood originally based on a sacred relationship *with the land*, to a livelihood dependent on a wage economy that is secular and requires living *off the land* (Ghostkeeper 1996).

This pattern of change has affected many Aboriginal people to varying degrees. Some are not as heavily impacted by the value shift when they enter wage economy (if they enter at all); some are satisfied to maintain the secular relationship and repress the sacred (perhaps urban ties are stronger); and some, like Ghostkeeper, are adapting the sacred to their relationship within the wage economy.

> In my own case, the revitalization of Spirit Gifting as a concept of spiritual exchange has provided me with a means to care for my family and prepare for the future, without sacrificing the quality of my relationship *with* the land and the other gifts of living beings (Ghostkeeper 1996).

The Western Approach to Economic Development

Typical Approaches to Value in Finance

Financial decisions taken by corporations include what projects or assets in which to invest. The goal is often to maximize the value of the investment in order to best meet the demands of shareholders for maximum dividends. What guiding principles have historically aided financial managers in reaching these decisions? One is: *A dollar today is worth more than a dollar tomorrow* (Brealey and Myers 1984). In other words "a future project expense has no impact on the project value today". This approach aims to set the cost or value of a project in the future (that of our children or their children) at zero. A second basic principle is: *A safe dollar is worth more than a risky dollar.* Risks to people and to the environment are not considered in this equation because such risks are not generally measured.

There are many strategies for determining the value of a project, including conducting a sensitivity analysis (consider all project determinants and then see the changes for optimistic and pessimistic views of each variable); generating a decision tree (values of subsequent decisions are quantified and various courses of action valued at each decision point) and performing simulations (a computer simulation generates values for all variables for a large number of scenarios) (Brealey and Myers 1984).

Many consequences, costs and benefits do not figure in such types of analyses. In these cases, the focus is on determining projected market share, revenue, expenses and ultimately profits. But what about the costs and consequences of investments that are not usually quantified? For example, the real cost of a logging project to the eco-system,

to the surrounding communities and to future generations. Environmental economics is an emerging field that attempts to deal with sustainable development issues.

A shift occurs when the focus moves from economic development (secular in nature, whereby decisions are made based on readily quantifiable costs) to "sustainable development" (secular issues are important in decisions, but equal consideration is given to less measurable costs related to environment, people, communities and future generations). Profit is still important but "reasonable profit" that honors the limits of resources replaces "maximum profit". The guiding principle of "maximization" shifts to "moderation" as the overarching goal of development.

Some business leaders have adopted the cause of sustainable development in answer to personal revelation, government sanction or regulation, consumer pressure, or a combination of these and other pressures.

Revising the Approach to Valuing Development and Measuring Success

Paul Hawken (1993) is a businessman who presents an ecological analysis of business, in which he argues for corporations to include environmental perspectives for long-term prosperity. He links a healthy planet with business in an essential partnership that must be nurtured in order to achieve the vision of the future shared by so many people. It is a new-era ecological business that follows the Industrial Age.

Hawken urges business leaders to rethink the ultimate purpose of corporations. Rather than focusing on making money and using corporations as systems for making and selling things, Hawken suggests:

> the *promise* of business is to increase the general well-being of humankind through service, creative invention and ethical philosophy... We have the capacity and ability to create a remarkably different economy, one that can restore ecosystems and protect the environment while bringing forth innovation, prosperity, meaningful work, and true security (Hawken 1993).

Hawken acknowledges that in the past, there was no need to understand or recognize any relationship between business and a healthy environment when the limits on natural resources could be ignored. Today is another matter, and the hard questions have evolved:

- "How can business itself survive a continued pattern of worldwide degradation of living systems?
- What is the logic of extracting diminishing resources in order to create capital to finance more consumption and demand on those diminishing resources?
- How do we imagine our future when our commercial systems conflict with everything nature teaches us?"

Hawken sees a productive relationship that will *restore* the earth using highly effective organizational and marketing techniques of free enterprise. Each partner can learn and benefit from the other. What measures of success become possibilities under this new paradigm? According to Hawken:

> The language of commerce sounds specific, but in fact it is not explicit enough. If Hawaiians had 138 different ways to describe falling rain, we can assume that rain had a profound importance in their lives. Business, on the other hand, only has two

> words for profit — gross and net. The extraordinarily complex manner in which a company recovers profit is reduced to a single numerically neat and precise concept. It makes no distinction as to how the profit was made. It does not factor in whether people or places were exploited, resources depleted, communities enhanced, lives lost, or whether the entire executive suite was in such turmoil as to require stress consultants and out placement services for the victims. In other words, business does not discern whether the profit is one of quality or quantity (Hawken 1993).

The most common measure of success is 'profit'. Now a more holistic approach tries to reflect the true value of decisions and the true-cost of profit. This approach goes to the source of the problems now facing the earth — that is, the decisions business routinely makes under the assumption that it operates in a vacuum.

Another common maxim that has guided business and has been used to justify decisions taken with a narrow ethical basis is Darwin's "survival of the fittest." According to Hawken:

> The phrase is, in fact, a misinterpretation of Darwinism. Darwin did not speak of survival of the fittest; rather, he described those who survived as *fittest for a specific ecological niche*. There is a big difference between those two ideas... [Today] the "winners" are the companies that consistently overstep and exceed carrying capacity. Corporate capitalism recognizes no limit and has no habitat (Hawken 1993).

Scale of operations and growth are cornerstones used in measuring the success of a competitive business. By changing the way success is measured to reflect the principles and goals of sustainable development, respect for the limits of our physical world and to a healthier way of doing business emerge. From an economic perspective, according to Daly and Cobb (1994):

> The scale of human activity relative to the biosphere has grown too large. .. population has doubled... Over the same time period, gross world product and fossil fuel consumption have each roughly quadrupled. Further growth beyond the present scale is overwhelmingly likely to increase costs more rapidly than it increases benefits, thus ushering in a new era of "uneconomic growth" that impoverishes rather than enriches.

Criticisms of growth and the cost of development are examined by some psychologists, economists, and ecologists who arrive at the same conclusions (Horney 1978, Polyani 1957, Shumpeter 1975, Weiskopf 1971). The goal of maximization must be exchanged for one of minimization — the minimum sufficient to meet the needs of the human family. While Hawken (1993) seeks to persuade business people toward a shift in paradigm, Daly and Cobb (1994) seek a similar goal by applying pressure on economists and suggest a perspective that shifts focus from personal preferences alone to "person-in-community". "The change will involve correction and expansion, a more empirical and historical attitude, .. and the willingness to subordinate the market to purposes that it is not geared to determine." This shift is away from individualism and toward community, without compromising the needs of the individual.

Daly and Cobb (1994) urge a vision that includes human communities and "the other creatures with whom human beings share the world... the economy that sustains the total web of life and everything that depends on the land". Their vision is personal and they express it strongly:

> ...at a deep level of our being we find it hard to suppress the cry of anguish, the scream of horror. We human beings are being led to a *dead* end — all too literally. We are living by an ideology of death and accordingly we are destroying our own humanity and killing the planet. Even the one great success of the program that has governed us, the attainment of material affluence, is now giving way to poverty... If we continue on our present path, future generations, if there are to be any, are condemned to misery.

Daly and Cobb (1994) suggest that where organizations follow a policy of sustainability, they must support projects that are sustainable. They must compare them to other sustainable projects. Where there is exploitation of a nonrenewable resource, there should be a complementary project that will ensure the sustainability of that resource. Daly and Cobb caution against using evaluation methods that are not inherently sustainable, for example, a project discount rate greater than 5%. Success, then, is measured in terms of the impact on the environment, resources and the quality of life for this and future generations.

Aboriginal Communities and Sustainable Development

Approaches — Cobb and Daly (1994) point to a new direction for economics, defined in terms of the community. In order to consider sustainable development within Aboriginal communities we must first define "Aboriginal communities".

It is easy to define the meaning of "community" for Aboriginal people living on a reserve or in a settlement because of distinct boundaries.

For the purposes of this paper then, the discussion regarding sustainable development focuses on the attitudes expressed by leaders of well-defined reserve and settlement communities. For some, the following observations regarding Aboriginal society lead to a number of possible conclusions that have some significance for the discussion at hand.

- Many Aboriginal organizations and processes strongly exhibit characteristics of mainstream society.
- Urban and reserve-based residents are examining their traditions and incorporating these traditions into every-day life.
- Aboriginal people are defining individual and collective identities based upon traditional cultural groups rather than legislation.
- Businesses will incorporate the western way of doing things and they will operate using Aboriginal values (Newhouse 1992).

Can Aboriginal communities operate more sustainably than western society? The answer is "No", because Aboriginal people are restricted to the same technologies and are able to make the same decisions as any community regarding such issues as the development of natural resources. Development can be more sustainable if decisions are made based on sustainable technologies, traditional knowledge, and a respect for nature as integral parts of development strategies.

Many community leaders recognize that balance is required for successful economic development. They listen to community members in developing a vision for the future. All projects are considered by an Elder's council and traditional knowledge is used in determining the project's appropriateness. By this process, any project that may be profitable but does not meet the community's responsibility to take care of Mother Earth is rejected. In Tsuu T'ina First Nation (Calgary, Alberta), the community codified its

beliefs into an environmental bylaw. All projects must meet the standards of this by-law before being approved.

Generally, Aboriginal people will consider any project including those that involve development of their natural resources in an effort to combat high unemployment and poverty. If approved, two things become important in the project: the legal right of Aboriginals to control their resources, and balancing needs in the community. Chief George Johnson, (Burwash Landing, Yukon), shared a story that illustrates his belief that the next generation of educated leaders must be reminded of their connection to the land.

> Chief Johnson tells how one day he and his children climbed to the top of their favorite mountain. They sat down at the top to enjoy the beautiful view of the valley and lake. He asked them, "Will your children be able to enjoy this same view with you?" They said "Of course." Then George said: "Won't you let strangers come in and rip up your land? The dollar is very powerful and you might forget what we have shared today when you are told that we are sitting on the largest ore body in the territory that extends from this mountain under the valley and the lake. I hope you do remember your ties to the land when that time comes. If you must have mines, choose somewhere else that isn't as special to our people as this spot. Better yet, put your money into investments that do not touch the land at all. Invest internationally, like in Saudi Arabia!" (Johnson 1993).

While some ambivalence exists, the main objective is to have options that have not been available to communities in the past. This is one of the underlying themes in the conclusions of the Final Report of the Royal Commission on Aboriginal Peoples (1996) regarding economic development. Striving for balance between western strategies and Aboriginal cultural pursuits and traditional beliefs is recognized and encouraged. The development of natural resources is encouraged but on a small-scale, using environmentally-friendly techniques that allow for flexibility in the exploitation of natural resources. Such techniques are not currently in the repertoire of multinational corporations. Developing a stronger traditional or subsistence economy — living on the land and with the land — is suggested as being economically viable since material goods and specialist services could then be provided in a renewable fashion. These activities also provide spiritual and cultural meaning for many Aboriginal people.

When a community decides that it will develop its resources, it is important to determine the most effective development strategy, and one that fits within the parameters expressed by the community. Decisions can be made based on the 'sustained livelihoods' approach. Which provides for a number of critical issues to be considered and judged according to standards determined by the community.

Sustained Livelihoods — With sustainable development as a goal, how can the underlying principles be incorporated into community development strategies and how will these strategies, once adopted, be judged as to their effectiveness? One approach suggested by the International Institute for Sustainable Development (IISD) (Barg *et al.* 1997) is based on sustained livelihood research, originally conducted by Chambers and Conway (1992). IISD has undertaken a number of studies in this area, most recently with the Department of Indian and Northern Affairs.

Sustainable development takes into account many different qualitative and quantitative aspects of living that are not generally part of the decision-making process in economic development. A matrix of environmental, economic and social issues is developed that integrates these considerations into one framework. It is a work in progress. It requires practical and detailed input from a community to refine it as a tool that might then be used regularly. The authors recognize the constraints of their work and state that the purpose of their project is to develop a tool for policy making and evaluating DIAND's programs for Aboriginal people.

More specifically, the matrix defines the components of sustainable livelihood as follows:

- "Ecology (of which we are all a part)
- economic activities, which are an important part of humanity's interactions with nature
- people (who are part of ecology) and their social and political activities
- culture and role of language
- the spiritual component of livelihoods" (Barg *et al.* 1997).

A particular program's influence on these components ranges from weak to strong and positive to negative (Barg *et al.* 1997). This influence shifts over time and contributes to the analysis of the program's effectiveness. Many of these components are difficult to quantify but this approach formalizes the consideration of these components. Issues and priorities under these components reflect the concerns of the user and differ between community and government groups.

The typical methods for examining success in development were reviewed. The sustained livelihood approach can be adapted to economic evaluations — economic benefits are evaluated according to the issues and priorities enunciated in the sustainable livelihoods approach. Using this combined method of review, the community will have enough information to make informed decisions regarding new projects and for supporting the continuance of projects once the sustained livelihoods approach has been suitably revised.

Summary

Developers of world resources must make a fundamental shift in assumptions and philosophies. The activities of the human family are exacting a cost that will be borne on the backs of future generations. Aboriginal people, through treaty and land claims settlements, are gaining title and cash compensation in such quantity that they are in a position to make a serious impact on the way development progresses. Will they honor their connection with Mother Earth to ensure that natural resources will be there to truly shine on the seventh generation?

Many members of the human family have taken up the call for sustainable development as an inevitability with business as a true partner in the process of shifting course from utter destruction. Daly and Cobb (1994), Hawken (1993), Ghostkeeper (1996) and Johnson (1993) are individuals who speak from their hearts about these issues. For them, spirituality is acknowledged in this paradigm and is integral to the components of sustainable development: economy, ecology and sociology. The trend towards secularization, begun so many years ago, has its usefulness but it has also had costs that are finally being recognized in many corners of the globe. For Aboriginal people, the question of the quality of life our descendants will have, may be answered largely by them.

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The Robertson Esker: Exploring Dene Roots on an Overland Trail

Virginia Petch[1]

The Dene of northern Manitoba are the most easterly group of the Dene Nation, and linguistically belong to the Northern Athapaskan family. Historically, their identity was determined by other groups. They were referred to by the Cree, for example, as *Chipewyan*, and by the early European traders and explorers as *Northern* or *Northwards Indians*. Anthropologists have referred to the Dene as *Edthen-edeli-dene* or *Caribou-eaters* (Gillespie 1976, Helm 1968, Smith 1976). The ethnohistorical record however, indicates that the Dene people identified themselves by their geographical location. For example, the people of Tadoule Lake in northern Manitoba call themselves *Sayisi-Dene*, which means *people of the eastern sun* (Smith 1981).

The Dene were well known for their overland travel. Early historical maps drawn by Dene men illustrate important overland routes which seemed to cross-cut major rivers and lakes (Figure 1). The land is called *denichule*, or "land of little sticks", and is characterized by bold bedrock outcrops and moss-covered, undulating hills interspersed with pockets of stunted taiga vegetation and myriad swamps, lakes, and streams. Long, narrow ribbons of sand called *eskers*, wind snake-like across the land, sometimes running beside, but often defiantly cross-cutting existing lakes and rivers (Figure 2).

The Glossary of Geology (Gary 1972) defines an esker as:

> ...a long, low, narrow, sinuous, steep-sided ridge or mound composed of irregularly stratified sand and gravel that was deposited by a subglacial or englacial stream flowing between ice walls or in an ice tunnel of a continuously retreating glacier and was left behind when the ice melted. It may be branching and is often discontinuous. (Gary *et al.* 1972)

There are thirteen eskers in northwestern Manitoba; the Robertson Esker is the longest in the province (Figure 3). It is characterized by a discontinuous ridge, often more than 30 m high, that tends in a northeast/southwest direction for over 300 km from the Northwest Territories Border to its terminus east of Brochet. Eskers are high,

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1. Virginia Petch (MA) is an ethno-archaeologist consultant at Northern Lights Heritage Services in Manitoba.

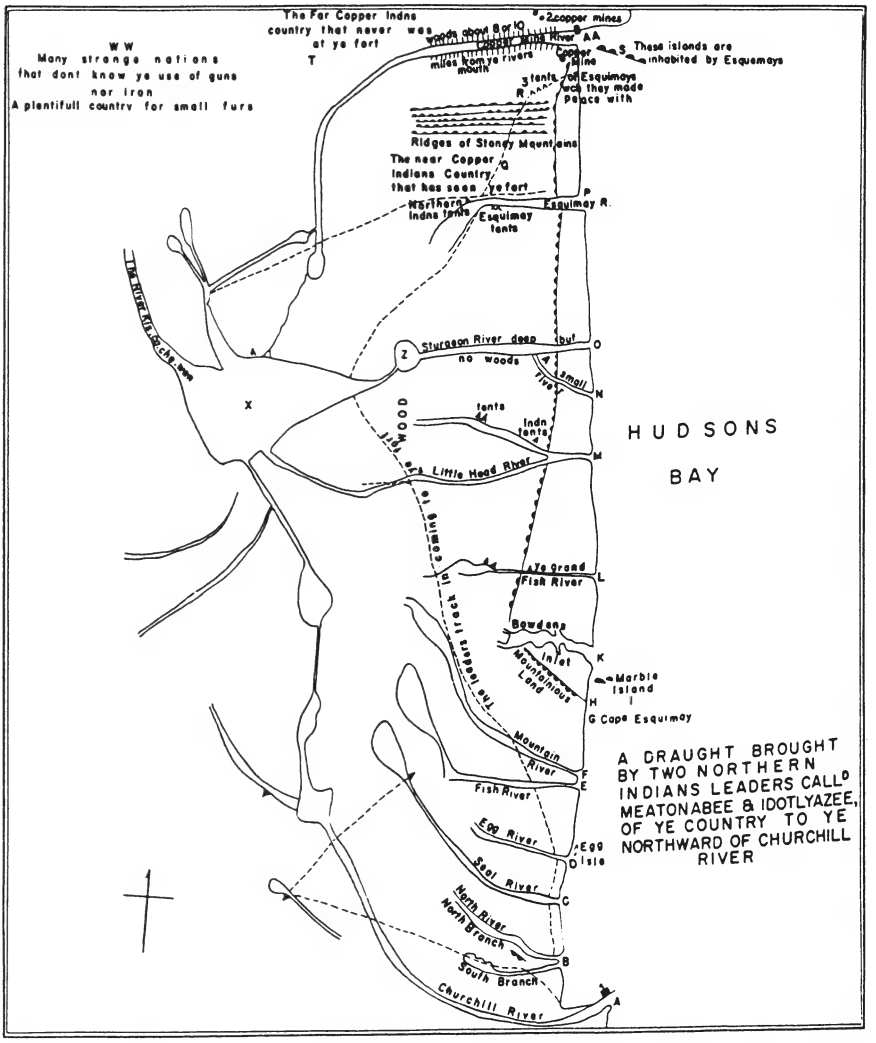

Figure 1. *Historical map showing early Dene route to and from Prince of Wales' Fort, Churchill. Copied from The Historical Atlas of Manitoba, Warkentin and Ruggles 1970.*

well-drained ridges providing natural trails for animal movement, and travel routes for humans through swamps and muskegs.

In 1996, a multi-disciplinary study of the Robertson Esker was conducted. Several goals and objectives were established by the study team and by each individual scientist.

The Robertson Esker Study Team originally intended to walk the length of the esker; however, an examination of air photos revealed a number of impassable wetlands at the southern portion. Once in the field, it became evident that the discontinuous nature

Figure 2. *A long winding segment of the Robertson Esker near the North Seal River. Photograph courtesy of Virginia Petch.*

of the esker would prevent us from completing our survey in the time allotted. It was decided that first the southern portion of the esker would be studied, and then a base camp established at the North Seal River, so that daily treks could be conducted north and south of the river. This proved beneficial, as it allowed more time for the team to study specific esker features.

The archaeological objective of the study was to examine the esker for evidence of past human activity, which suggested its use as a travel route, and a hunting location. Gordon (1976) hypothesized that the concept of discrete band/discrete herd association could be applied to describe the movement of a culturally-distinct people in response to a biologically-distinct caribou herd. If eskers were used by caribou for migration to and from the barrengrounds, and if ancient people followed the herds, a discrete band/discrete herd pattern should emerge from comparisons of diagnostic tools located at specific points along the migration route.

Arimoto (1981) identified two types of caribou hunting methods — extensive and intensive — based on his fieldwork with the Hatchet Lake Band. Extensive hunting involved erecting "fences" as interceptions at strategic water crossings, which allowed for "corralling" of large numbers of caribou quickly, a method used when herds migrated south for the winter. Intensive hunting was used during winter, and involved stalking one or two animals at a time. Because there would be little archaeological evidence for this latter form of hunting, the research team focused on evidence of extensive hunting at strategic locations.

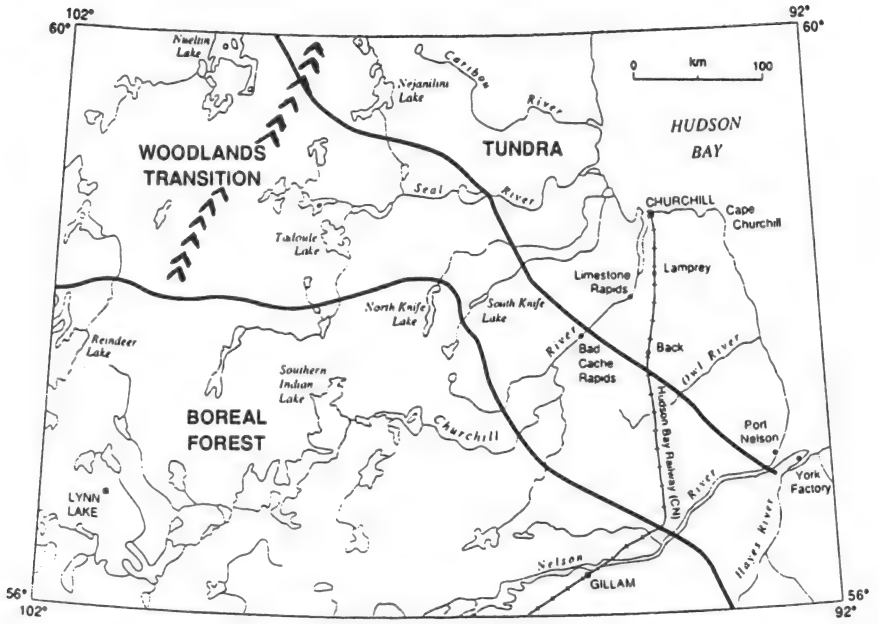

Figure 3. *The Robertson Esker in Northern Manitoba. Copied from Dredge et al. 1986*

Studies of the Robertson Esker at the North Seal River provided good archaeological evidence of use of the feature as a travel route and an interception point for corralling caribou for ancient hunters.

Two important sites on the south side of the North Seal River were identified as hunting grounds. On the esker ridge, a linear feature characterized by large, evenly-spaced boulders, was determined to be the remains of a "fence" leading to a large sand dune area, where tools were found, which may have been used to kill the caribou as they descended the steep esker slope into the dune area. A white quartz semi-lunar knife, a pink granite lenticular projectile point, as well as scrapers and flakes were recovered from this area (Figure 4).

At the river's edge, on the lower terrace, another important site was located — a multi-component site, that contained both historic and prehistoric strata. Two bone beds were identified. A top layer near the surface was associated with historic artifacts; a second bone layer was found below, separated by approximately 10-15cm of organic material. Stone tools found in this second layer may represent a potential kill or butchering site. It may have been the point of intercepting caribou.

The stone tools recovered from this field study were compared with those found by Nash (1975) during his field investigations of the northern transition zone in the 1960s and bear most similarity to artifacts from Mountain Lake, N.W.T. at least 300 km north, and identified as Middle Phase of the Taltheilei Tradition (*ca* A.D. 500).

On examining the course of the Robertson Esker into the Northwest Territories, there is a strong possibility that Middle Taltheilei people used the esker to travel to and from

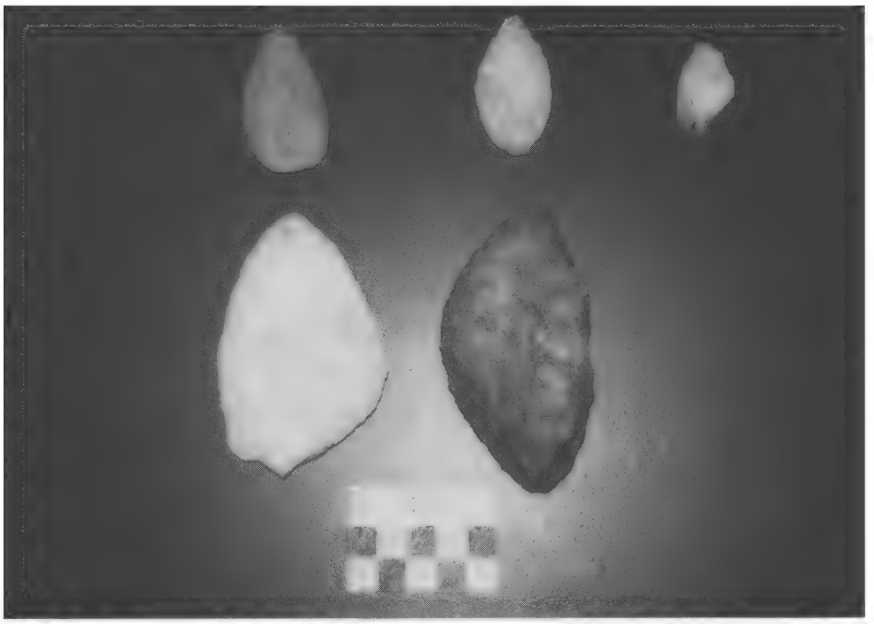

Figure 4. *Artifacts recovered from the Robertson Esker, south of the North Seal River*

the barrengrounds, following a specific caribou herd. If this is the case, then Gordon's hypothesis of discrete band/discrete herd may apply. This may provide an important link with the Sayisi-Dene of Tadoule Lake, as historical and oral history records of these people identify the area between Mountain Lake and the North Seal River as part of the traditional hunting area. This would suggest that not only did the ancestors of the Sayisi-Dene use eskers as travel routes to and from the barrengrounds, but that they also had special interest in a specific herd of caribou. This suggests an incipient form of pastoralism, which could have developed along similar paths as the Saami of Scandinavia of Northern Europe, if it had not been for interruption by the fur trade.

Acknowledgements

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Future Research

Further fieldwork will be undertaken to examine the progression of plant and animal habitat along the course of the esker, as well as the human use of eskers as travelways. The site at the North Seal River will be excavated during the summer of 1997, pending funding, and the remainder of the esker to the N.W.T. border will be surveyed in 1998.

The multidisciplinary approach taken in this project demonstrates the value of examining biophysical settings from a holistic perspective. The human and land relationship is much more meaningful when this approach is taken.

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The Arctic Council and Northern Aboriginal Peoples

Rob Huebert[1]

The Arctic Council, officially created on September 19, 1996 is the first state-level multi-lateral organization focused entirely on circumpolar relations. Of even greater significance was the formal inclusion of three northern Aboriginal organizations as 'Permanent Participants' in the Council: the Inuit Circumpolar Conference (ICC), the Saami Council and the Association of Indigenous Minorities of the North, Siberia and the Far East of the Russian Federation. This status confers these organizations the right to participate in all forums associated with the Council, including all decision-making discussions. While it does not provide a right to vote, the fact that state members of the Council must reach consensus on all issues suggests that the three northern Aboriginal organizations will carry a *de facto*, if not an official, veto.

It is the contention of the author that the Arctic Council constitutes an important development in the international process of "Global Governance". The elevation of Aboriginal organizations above 'observer status' suggests that official recognition of the participation of Non-Government Organizations (NGOs) in international organizations is now becoming a reality. As exciting as this (largely unheralded) development is, there are three issues concerning the role of Permanent Participants on the Arctic Council that must be considered before this event will be fully understood. Issues of decision-making, representation, resources, and related political implications are discussed and a summary of the Arctic Council and Arctic Environmental Protection Strategy form the basis of this paper.

1) Decision-Making — The official declaration of the Arctic Council states that the designation "Permanent Participants" has been created "to provide for active participation of, and full consultation with, the Arctic Indigenous representatives within the Arctic Council". The Declaration also stipulates that "Decisions of the Arctic Council are to be made by consensus of the Members", with "Members" defined only as 'states' and not 'Permanent Participants'. So what, then, will be the role of the participant? Will Permanent Participants be allowed to participate in the debate, only to be ignored in the actual vote on an issue, or will they be able to "tie their vote" to that of one of the state members? Precedent for this issue was established in the role of the ICC on the

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Arctic Environmental Strategy Programme (AEPS), and decision-making procedures of the AEPS have served as a model for the Arctic Council. Therefore, an evaluation of the role played by the ICC in the AEPS will provide a strong indication of what can be expected for the Arctic Council.

2) Representation — The ICC, the Saami Council and the Association of Indigenous Minorities of the North, Siberia and the Far East of the Russian Federation have Permanent Participants status on the Arctic Council. The official Declaration provides for the admission of four additional Permanent Participants; however, it is stated explicitly that "(t)he number of Permanent Participants should at any time be less than the number of members". Since there are eight members, only four additional Permanent Participants can be admitted. While the Declaration outlines the criteria for Permanent Participation status, there is no means for determining the action to be taken if more than four new Indigenous groups wish to be included. Given that Aleuts from Alaska as well as Métis from Canada have already indicated a desire for inclusion, the remaining four spots will no doubt be filled very quickly.

3) Resources — The three current Permanent Participants face the same difficulties as most NGOs. Understaffing and resource shortages have been especially chronic for the Russian-based organization. With the added responsibilities their newly-acquired status on the Council brings, the issue must now be addressed. How will the Permanent Participants adapt? Will they be able to participate fully or will staff and financial limitations restrict their involvement?

4) Political Issues — The Arctic Council was conceived and created to consider all issues concerning the Polar Regions. Officially, the Council is currently in the process of establishing its rules of procedure. Nevertheless, even within the context of institution-building, a dispute is developing with regard to harvesting marine and fur-bearing animals in the north.

By focusing on these four areas, some general observations on the role of NGOs in international organizations can be made. The new status accorded northern Aboriginal organizations is indeed an important movement in the process of global governance. However, before the roles can be examined, it is important to explain how the Arctic Council was established and how the role of the three Aboriginal organizations evolved.

The Establishment of the Arctic Council

The *Declaration on the Establishment of the Arctic Council* (1996) was officially signed by all eight arctic nations in Ottawa on September 19, 1996 representing the cumulation of almost a decade of effort. During a visit to Leningrad in November 1989, Prime Minister Brian Mulroney officially declared his support of such a Council, seeing its creation as beneficial for all arctic nations, but especially for the Indigenous peoples of the Canadian north. Following Mulroney's proposal, an independent panel of Canadian arctic experts convened to examine the potential for the establishment of an Arctic Council and to consider its possible structure (Arctic Council Panel 1991). Following a series of trips to the Canadian Arctic, the panel drafted a preliminary model and met with Canadian federal and territorial government officials in October and November of 1990. Members of the panel included Franklyn Griffiths, Rosemarie Kuptana, John Amagoalik, William Erasmus, Cindy Gilday, Stephen Hazell, John Lamb, and Mary

Simon. They believed that Canada should demonstrate leadership and utilize its skills in multi-lateral negotiations to improve cooperation among arctic states, and with the end of the Cold War, the time had arrived in which more cooperative behaviour could be encouraged.

The panel emphasized the importance of full participation by northern Aboriginal groups (Scrivener 1996). They suggested the Council should comprise the eight arctic nations, a delegation representing the arctic Indigenous peoples' organization and another delegation representing the arctic territorial governments. The ten representatives were to operate as equals within this new international body.

The withering away of the Cold War and other factors began to drive home the fact that not only would an Arctic Council be a positive step toward international cooperation, it would be necessary as a means to address several international environmental problems. Toward the end of the 1980s, scientific findings indicated that the circumpolar north, long thought to be a pristine environment, was facing tremendous environmental degradation.

The affect contaminants have on northern peoples is intensified because food sources are limited to a few animal species. When contaminants are introduced into the food chain in the Arctic, they become concentrated, and a dependence on affected animal species in the traditional diet (e.g., seal, caribou) creates serious health risks. The Indigenous population must chose to either continue to harvest these animals and accept risks presented by such concentrations of contaminants or adopt a "contemporary" or "urban" diet. The problem is that a "modern" diet requires participation in the monetary economy. "Modern" diets also tend to be unbalanced, and hence unhealthy, and adoption of a modern lifestyle can result in the abandonment of traditional hunting and trapping.

What has further undermined this issue is that the Indigenous populations inhabiting the polar regions are relatively small compared to that of the states to which they belong. The Yupik, Inupiat, Aleut, Athabaskan, Tlingit, and Tsimshian peoples make up only 15% of the population of Alaska (85,000 out of 550,000) (Chaturved 1996). In Canada, the total northern Indigenous population is estimated to be about 52,000 and includes Inuit, Inuvialuit, Métis, Yukon Indians, Athabaskan Indians and Cree; only 1/3 of 1% of the total population. The Saami in Norway, Sweden, Finland and Russia number approximately 60,000. Only Greenland's 45,000 Inuit represent a majority (there are 55,000 inhabitants). Although Greenland has a Home Rule government, Denmark still retains ultimate control of the island. Finally, in Russia the Indigenous populations (26 peoples are officially recognized) number over 1,000,000 (Chaturved 1996). Thus, the population of the northern Indigenous peoples is only 1,242,000 of a total population of over 550,000,000. It is not difficult, then, to understand why the concerns of the northern peoples are overlooked.

Given the magnitude of this problem, and its transboundary nature, any effort to resolve the problems facing arctic nations must be considered from an international point-of-view. Furthermore, all arctic nations are facing challenging economic circumstances. The former Soviet Union is the most extreme case, but even Canada finds its own actions constrained by the restrictions imposed by fiscal realities. In short, any efforts to counter Arctic issues, such as pollution, must be undertaken as a collaborative effort.

Arctic Environmental Protection Strategy (AEPS)

In many regards, the AEPS (precursor to the Arctic Council) has set a precedent for the inclusion of northern Indigenous organizations at a status greater than non-governmental organizations (NGO's).

The AEPS was created following the initiative of the Finnish Government led by Ambassador Esko Rajakoski at the end of the 1980s (Rajakoski 1989). Negotiations began in October 1988 with the other seven Arctic states and, as a result of positive feedback, a proposal was officially launched on January 12, 1989. Following a series of organizational meetings, the eight Arctic nations met at the ministerial level in Rovaniemi, Finland to sign the Declaration on the Protection of the Arctic Environment and to formalize the accompanying strategy, which consisted of a set of objectives and principles; the identification of six main types of pollutants — persistent organic contaminants, oil, heavy metals, noise, radioactivity, and acidification, the identification of existing mechanisms for the protection of the Arctic Environment, and on action to be taken to counter the pollutants (*Arctic Environmental Protection Strategy* 1991).

Three main commitments were made at Rovaniemi that would implement the strategy. The first was to continue to meet, on a regular basis, at the ministerial level to ensure that the strategy remained an ongoing process, and that it be given a high political profile. The second was a commitment to involve Indigenous people in the process. The third was to establish four working groups to oversee the Arctic Monitoring and Assessment Programme (AMAP), the Protection of the Arctic Marine Environment (PAME), the Emergency Prevention, Preparedness and Response (EPPR), and the Conservation of the Arctic Flora and Fauna (CAFF).

Although the AEPS recognized that without the "full participation" of Indigenous peoples, efforts to address the environmental problems facing the Arctic would be meaningless, it was not determined what was meant by "full participation"; this would evolve over the life of the strategy. Nevertheless, recognition of the role of northern Indigenous peoples in the process was an important first step in the development of the concept of permanent participant.

At the second ministerial meeting held in Nuuk, Greenland in September 1993, much of what was agreed to in Rovaniemi was reaffirmed. However, since the convening of the first meeting, the United Nations Conference on the Environment and Development (UNCED) had been held in Rio (1992) (Bankes *et al.* 1993). The influence of that conference was considerable, in fact, was specifically mentioned in the official declaration "The Nuuk Declaration on Environment and Development in the Arctic" (AEPS 1993), reflecting the ministers' desire to link their work with UNCED. On a more substantive basis, it was decided that a fifth working group, the Task Force on Sustainable Development and Utilization (TFSDU), would be created within AEPS.

It was at the Nuuk meeting that the role of Indigenous peoples in the Council was given more substance. The ICC, while acknowledging the importance of the AEPS, were critical of the process by which it was proceeding. They lobbied for, and were successful in, gaining full participation in all discussions. Following the first Ministerial meetings of the Council, the three main Indigenous organizations were given the right to participate fully in the proceedings of the four working groups of AEPS. However, they were not allowed to participate in all of the senior governmental discussions. At Nuuk, it was decided that in the future, all discussions would be open to the three organizations. In order to assist Indigenous groups coordinate their positions, the Government of Denmark and the Greenland Home Rule Office in 1994 established the

Indigenous People's Secretariat in Copenhagen to act as a coordinating body for the three organizations.

At the third ministerial meeting in Inuvik, Canada (March 1996), the progress of the working groups and task force were evaluated (AEPS 1996). However, the fact that negotiations for the establishment of the Arctic Council were developing successfully meant that attention was already moving away from the AEPS. Nevertheless, at Inuvik, the three Aboriginal organizations were granted full participation in discussions.

The reluctance of certain arctic states to allow for the full participation of Aboriginal groups can be ascribed to several factors. First, and perhaps most importantly, there was concern expressed by several states, that the inclusion of these groups could encourage movement toward some form of self-determination. It was feared by some European and American officials that if those organizations were to be elevated beyond the status of observer group, it could give rise to demands among northern peoples for a greater degree of autonomy. Second, there was resistance to the idea simply because there was no precedent. Therefore, as with most new approaches to international cooperation there was resistance to changing the *status quo*.

Despite these concerns, the Permanent Participant status was granted. The success of the three Aboriginal groups in achieving this can be attributed to at least three factors. First, the ICC and the Canadian delegation have a close relationship and ICC efforts for greater participation rights were normally supported by Canada. Second and related, Canada had already developed a policy of allowing for the full participation of northern Aboriginal communities in its domestic Northern Contaminants Programme (NCP) — the principal National effort to address the problem of northern pollutants. The success of that programme can be partly attributed to the willingness of the Canadian government to allow for the complete involvement of representatives of all northern Indigenous peoples in its planning. This participation even includes discussion of budgetary matters (VanderZwaag 1996). The third factor resulted as an aftermath of the Rio Conference. The participation of NGOs, and in particular Aboriginal NGOs, received great attention, and was seen as a positive step in addressing the global problems of pollutants. Before examining how these rights were extended to the Arctic Council, it is necessary to explain how the Council was formed.

Arctic Council

Following Mulroney's proposal in 1989, the Canadian Secretary of State for External Affairs, Joe Clark, announced on November 28, 1990, that the issue of the Arctic Council would be brought to the attention of the other arctic states. Progress was slow, mainly because of American concerns regarding the scope of the Council. However, Canadian officials continued to press the Americans for their support; these efforts culminated in a series of consultations between Canadian Foreign Affairs Minister, Andre Ouellet, and American Secretary of State, Warren Christopher, through January and February 1995 after which the Americans agreed to revise their position and to support the initiative (Canada 1995a).

The process was significantly strengthened when the Canadian Government in 1994 created the position of Ambassador of Circumpolar Affairs and appointed Mary Simon, who had been a member of the independent panel that had initiated discussions of a Council. Furthermore and more importantly, Simon who is of Inuit background, had also served as President of the ICC, and had an intimate understanding of the proposed Council from several perspectives.

Following her appointment, Ambassador Simon conducted extensive meetings. In March 1995, and after a series of bilateral discussions with the eight arctic states and Indigenous peoples' organizations, a decision was made to convene a meeting of senior arctic officials in June 1995 (Canada 1995b). Agreement was reached at this meeting which led to the September 19, 1996 official signing of the Arctic Council *Declaration*.

The Canadian Government anticipated that the Arctic Council would concern itself with a broad scope of issues affecting the Arctic, an expectation based on the fact that while the AEPS was important, a broader arctic forum was needed (Canada 1995a). Although it was hoped that this would include issues related to security matters, the United States refused to participate if this was the case. As a result, the *Declaration* specifically contains a footnote that states "[t]he Arctic Council should not deal with matters related to military security". Instead, issues of sustainable development will form the nucleus of the Council's concerns in its early years.

The Council's adopted structure is indicative of its focus on sustainable development and environmental protection issues, furthered by its connection to the AEPS and a planned sustainable development program. The *Declaration* states that the Council shall "1. (c) adopt terms of reference for, oversee and coordinate a sustainable development program." Since the terms of reference have not yet been determined, it is too early to know what form this program will take.

The Inclusion of Permanent Participants

One of the most innovative aspects of the Arctic Council's structure is the inclusion of three northern Aboriginal bodies as Permanent Participant parties. As significant as this is, Canada originally proposed to include several other non-government organizations, such as the International Arctic Science Committee (IASC) in a similar capacity but such a move was successfully resisted by the other states.

Canadian Ambassador Simon reported that during the negotiations leading to the creation of the Arctic Council, there was considerable resistance to the inclusion of Indigenous groups beyond the usual status as NGOs. However, since the precedent had been established through the AEPS, it was difficult for those opposing the inclusion to prevail.

Although it is difficult to determine for certain which of the states were opposed to the inclusion of Indigenous organizations, there is some evidence to suggest that the greatest resistance came from the United States, who viewed the designation as a potential source of future problems. Specifically, American representatives questioned whether the United States or the ICC would be speaking for the Inuit in Alaska. There are also reports that they had concerns that permanent participant status could give rise to a push for Inuit self-determination. Ambassador Simon's counter-argument was that the lack of any real representation of northern peoples' interest is what led to the need for special status.

After considerable debate, primarily between American and Canadian officials, agreement was reached that the three permanent participants of the AEPS would retain their designation as permanent participants in the Arctic Council. On this issue, the *Declarations* clearly state:

> "2. (2nd para) The Inuit Circumpolar Conference, the Saami Council and the Association of Indigenous Minorities of the North, Siberia and the Far East of the Russian Federation are Permanent Participants. Participation is equally open to other

arctic organizations of Indigenous peoples* with majority arctic Indigenous constituency, representing:
(a) a single Indigenous people resident in more than one arctic state; or
(b) more than one arctic Indigenous people resident in a single arctic state.

The determination that such an organization has met this criterion is to be made by decision of the Council. The number of Permanent Participants should at any time be less than the number of members.

The category of Permanent Participation is created to provide for active participation and full consultation with the arctic Indigenous representatives within the Arctic Council.

(*The use of the term "peoples" in this *Declaration* shall not be construed as having any implications as regard the rights which may attach to the term under international law.)" (Declaration...1996)

This development can be attributed to four factors: 1) the existence of precedent in the AEPS; 2) the support provided by Canada; 3) leadership provided by Mary Simon; and 4) a recognition of the contribution these groups offer to policy-making in the Arctic. There is little doubt that without the precedent provided by the AEPS, the inclusion of these three Aboriginal organizations in the council would have been much more difficult, if not impossible. That their inclusion was shown to be not only possible but beneficial to the AEPS made the move to extend their role within the Arctic Council a much easier proposition.

Throughout the process leading to the acceptance of part 2 of the *Declaration*, Canada was the main supporter of the inclusion of Aboriginal representation and much of the credit is due to Mary Simon. While there are reports that her negotiating style was not always appreciated by American officials, there is no doubt that her determination to ensure permanent participant status for those organizations was crucial. However, while her role as chief negotiator was critical, Ambassador Simon would not have succeeded in her quest had it not been for the support of the ministers of foreign affairs, Andre Ouellet and Lloyd Axworthy. While little has been written on this point, it is clear that Simon enjoyed the full confidence of other ministers.

It is also important to note that the contribution made by the Permanent Participants to policy is increasingly recognized. Because they represent the main stakeholders in the arctic regions, both the officials negotiating the terms of the Arctic Council and their political masters are more willing to accept them as partners in the system.

While the willingness to recognize Aboriginal groups can be attributed partly to enlightened policy, their inclusion has effectively reduced the responsibilities and workload of the voting members. For example, the ICC has limited resources, but it was this group and not any arctic government that was responsible for introducing the principles of sustainable development into the circumpolar forum (Bankes *et al.* 1993). Consideration of the arctic regions was conspicuously absent in UNCED documents, and there is little evidence that any of the arctic states were willing to make an effort to push for the recognition. Their hesitancy, pushed the ICC to use its resources to further the issue, and it became instrumental in defining arctic sustainable development (ICC 1989, 1992, 1994). This work led to the development of the *Task Force on*

Sustainable Development and Utilization of the AEPS. (The AEPS was created, with four working groups, none dealing directly with issues of sustainability).

Further evidence of the importance of sustainability is in the two programs created to support the Arctic Council — the AEPS and the Sustainable Development Initiative. Had the ICC not focused on sustainability, one of the arctic states might have advanced the issue, but it is also entirely possible that none would have been willing to invest in it.

Political Implications

Challenges for Aboriginal Peoples on the Arctic Council — Four main issues must be considered to properly assess the significance of inclusion of Aboriginal groups: 1) what decision-making power will be bestowed upon Permanent Participants? 2) what is the resource base of these groups? 3) how will new requests for membership be addressed? and 4) what role will permanent participants play in the discussion of important issues? It is too early to answer these questions, but preliminary discussion of each might be useful.

Decision-making — There has not been opportunity to observe the Arctic Council in action, and so, it is difficult to know how Permanent Participants will perform. However, the AEPS experience can provide some insights.

Many Canadian and American government officials have commented on the positive role of permanent participants in the AEPS process. Some officials privately confessed to initially harbouring misgivings, expecting the three groups to take confrontational positions. However, their concerns were quickly dissipated when it became apparent that the objective was to engage in a meaningful discussion of arctic issues.

In particular, Aboriginal NGOs ensured that actions taken by the AEPS were fully understood by Indigenous populations. Of equal importance was that governments understand the importance of the knowledge that northern peoples could contribute to the protection of the environment. As a result, the AEPS took steps to explain the threat presented by various contaminants in terms understood by Indigenous peoples. Furthermore, the permanent participants ensured that traditional Indigenous knowledge was integrated into the overall assessment procedure (AEPS 1996).

This led to a general sense of satisfaction on the part of both the permanent participants and the AEPS. In the words of a representative of the Saami:

> My opinion is that the three Indigenous organizations are satisfied with their possibilities to participate in the AEPS process. I think the international governments over the last few years have changed their attitudes towards the Indigenous Peoples, by giving them the possibilities of getting directly involved in matters of their concern. I also think that our involvement has the effect that the work being produced within the AEPS process is of much greater value (Halonen n.d.).

In general, the participation of Aboriginal NGOs (and in particular the ICC) has been effective for all four of the working groups, and the task force of the AEPS. The main obstacle is a lack of allocation of resources. The ICC in particular would like to participate more actively, but a lack of resources force them to be selective. Thus, they have focused their attention on AMAP, TFSDU, and to a lesser degree CAFF. While

they are interested in the proceedings of PALME and EPPR, there are not enough staff to attend all meetings.

Resources — Again, the main obstacle to participation is a lack of resources. While all three groups have limited funding, the Russian organization faces the most severe situation (Pika *et al.* 1996). Conversely, the ICC has the greatest access to resources, enough to maintain a staff of between 8 and 20 individuals in Canada, Alaska, and Greenland. The geographic mandate makes it easy to appreciate the challenges that these groups face.

Of the eight arctic states, only Canada, Denmark, and Norway allocate substantial resources to the northern Aboriginal groups. Canada has provided base funding to the ICC for some time now, and since 1991 it has provided assistance to the Russian Association through CIDA. Norway, and to a more limited extent, Finland and Sweden, provide a small amount of funding to the Saami. Since the Nuuk meeting, Denmark has hosted an Indigenous Peoples Secretariat of the AEPS in Copenhagen. However, it is uncertain whether it will be willing to contribute this support to the Arctic Council.

The Permanent Participants face more serious funding problems. As it stands, they are all almost entirely dependent on the state. If Canada, Norway or Denmark decides to withdraw their assistance, there are few alternative financial sources. Short of developing their own taxation system, there is little the Aboriginal groups can do. Any effort to develop a taxation system would be strenuously opposed by most, if not all, of the eight states.

The lack of resources presents a contradiction in the terms of Permanent Participant status. While they have a right to participate as equals, they are dependent on others for the resources to fully exercise this right; a dependence that could eventually be used to ensure compliance if a Permanent Participant should take a position opposed by the state members.

Membership — The involvement of the three northern Aboriginal organizations as Permanent Participants on the AEPS occurred in an *ad hoc* fashion. The ICC was mobilized to participate as an NGO as soon as discussion of an AEPS began. When the ICC successfully marshalled support for inclusion, the five states not represented by ICC wanted to ensure representation for their northern Indigenous peoples. Thus the Saami Council and the Association of Indigenous Minorities of the North, Siberia and the Far East of the Russian Federation were added as participants. It is important to note that these three organizations do not represent, or claim to represent, all northern Indigenous peoples. This created obvious problems for the Arctic Council; section 2 of the *Declaration* was added to allow for additional Permanent Participants. A Permanent Participant can be an Indigenous organization whose membership crosses state boundaries (e.g., Aleuts in Alaska and Siberia); or an organization of several groups of Indigenous peoples within one state (e.g., Athabaskans and Aleuts of Alaska). Only four new Permanent Participants will be admitted, based on the requirement that these groups cannot equal or outnumber the state parties, which is eight. Decisions regarding new appointments are made by the Council, with consensus by all members, in keeping with the normal operating procedure.

Already there has been substantial 'jockeying' as new groups prepare their bid for membership. The Canadian government is encouraging the Dene, Métis, Yukon First Nations and Gwich'in, among others, to form an organization in order to be eligible to

apply. There are signs that the US has also been supportive of the Alaskan Aleuts and Athabaskans forming an association for the same purpose.

It will be instructive to observe the response of state parties to applications. Will they be open to expansion or will new members be discouraged? If a group is refused, can it re-apply? Will the refusal of one group degenerate into vetos as retaliation? If expansion occurs, what will happen to the dynamics of the Council? Expansion could lead to a better representation of the interests of Indigenous peoples, and could also disturb the current existing working relationship.

Issues — The core issue facing the Arctic Council is sustainability *versus* conservation. At the risk of over-simplifying a complex issue, one of the main debates involves the three Permanent Participants and several NGO conservation groups arguing the right to harvest marine and fur-bearing mammals. Several of the state parties have taken sides in this debate — Canada and Norway argue in support the Indigenous position, while the United States supports several animal rights groups.

For the Indigenous groups, the right to harvest marine mammals is of utmost importance. Hunting and trapping have been core economic activities in the north for time immemorial. For many northern Aboriginal peoples there is no alternative to hunting and trapping as a means of livelihood, and the ban on the fur trade has had a devastating impact on their lives. Opposing them are supporters of animal rights groups who believe strongly in their cause and have mobilized political support in the continental United States. The issue does not lend itself to easy solution or compromise.

There are signs that this particular issue is already affecting the operations of the Council criteria. The rules of procedures have been delayed because of disagreement over the criteria governing the granting of observer status. The American delegation prefers an open-door policy; Canadian and Norwegian officials are concerned such a policy will make it possible for animal rights groups, the International Fund for Animal Welfare (IFAW) in particular, to be granted observer status on the Council. The Canadian and Norwegian governments recognize that most animal rights groups would be opposed to the trade in marine and fur-bearing mammals. The Canadian position is that observer status should be reserved for groups having a northern focus. The outcome of this debate will attest to the ability or inability of Permanent Participants achieving their objectives through the Arctic Council.

Conclusion

The Arctic Council is a newly formed institution, and it is too soon to know how successful it will be. However, by recognizing the participation of Indigenous peoples in discussions, it has already made an important contribution towards international cooperation on Arctic issues. The acceptance of the contributions of northern Indigenous peoples to policy will be important for global governance. There are still enormous challenges facing the Council and its success in responding to those challenges will serve as a model for future efforts to promote international cooperation between states and Indigenous peoples.

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IV. NORTHERN FISHERIES

Challenges Facing Northern Canadian Fisheries and Their Co-Managers

James Reist[1] and Margaret Treble[2]

Fisheries in northern Canada have a set of common fundamental attributes, as well as specific aspects relevant to the particular fishery. These attributes constrain the fisheries and introduce complexities to the management regime, which must be considered when making decisions regarding the management of the fishery. The aims of this paper are to outline the complexities and challenges inherent in northern fisheries, and to provide some suggestions for an integrated approach to their management. The management of the broad whitefish fishery of the lower Mackenzie River system is used as the example.

General Attributes of Northern Fisheries

All fisheries are renewable resources, which means that the biological populations can regenerate and the productive capacity can be sustained for long periods of time given the proper conditions. The fundamental fishery management problem is to achieve a balance between the removal of the resource and its renewal so as to ensure the long-term sustainability of the biological population and the fishery based upon it.

Attributes of Biological Populations. Fisheries are based upon biological populations, and have a number of basic parameters that include the rate of removal of individuals from the population (i.e., mortality due to both natural causes and to human causes such as fishing), and the rate of production of individuals (i.e., number of individuals reproducing at a given time, the frequency of reproduction, and the number of offspring that survive to adulthood to reproduce in turn). These parameters work in opposition and result in net gain (or loss) of individuals in the population. The number of individuals refers to the population, which equals the balance between loss and additions, so the balance is dynamic — changing in response to various influences. Thus, fish populations are components of complex aquatic ecosystems, which also

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consist of other biological components (e.g., populations of prey organisms), as well as non-biological components (e.g., physical and chemical attributes).

Attributes of Northern Fish Populations. Attributes of both the fish populations and the ecosystems of which they are components change temporarily and spatially. Generally, the diversity, measured as numbers of species, decreases in the north. The non-biological portion of the ecosystem changes too; the period during which productivity is lowest (i.e., winter) becomes longer. As a result, the time available for growth of both individuals and populations (i.e., biological productivity) is shorter further north. For example, northern fish populations often compensate for limited productive periods by decreasing the periodicity of spawning to every two or three years instead of annually as in southern populations (Reist and Bond 1988). These factors have fundamental effects on northern fisheries which must be considered during sustainable management. For example, because of lower diversity, fewer species are available to fisheries. This focuses all the efforts of fishers on a few, or even one, species. Lower productive capacity generally results in fewer individuals being available to the fishery if it is to remain stable and sustainable over the long term. Also, because of this, northern fish populations take longer to recover from adverse effects and thus the consequences of inappropriate management actions may last a longer time in the north than in the south. Because the most productive aquatic habitats are usually spatially distinct from habitats conducive to spawning and survival of eggs and young, adult northern fishes often undertake long-distance, seasonal migrations between critical spawning and feeding habitats. During these migrations, fish are concentrated both spatially and temporally, making them easier to harvest, especially in rivers. The risks associated with exploitation, and factors such as environmental and local habitat changes, and accidents are also higher for migratory species. Another important factor in the north is a greater reliance of the human population on renewable resources (natural as opposed to cultured). This is particularly true for Aboriginal peoples who value fish populations as a means of subsistence (subsistence fisheries), income (commercial fisheries), and for social and cultural reasons.

Challenges Facing Northern Fisheries and Managers

Challenges to Fish Populations — In addition to limitations on productivity and constraints on recovery, northern fish populations face a number of challenges. Many of these are especially true for aquatic ecosystems such as the Mackenzie River which is very large and which flows northwards, thus both transporting and concentrating southern impacts into northern areas used by fish such as broad whitefish. Human-driven factors such as global change (e.g., climate change, ozone depletion) (Reist 1994), deposition of contaminants, local habitat alteration (e.g., hydroelectric developments and blockage of migratory routes), and exploitation (especially multiple, sequential fisheries on the same stock), all act individually on fish populations and are increasing in their intensity. Furthermore, such factors also act together to produce both additive and multiplicative (synergistic) cumulative effects on the population (Reist 1997a). Such effects are usually negative in that they increase mortality, decrease reproductive output, and thus decrease the level of sustainable exploitation. Other features of the environment such as year-to-year variability in local climate also affect northern fishes, and may result in wide shifts in population size from one year to the next, but life spans of northern fish are long relative to southern populations. Declines

may occur quickly but recovery does not. These factors all interact with the productivity parameters of the fish population over both the short and long-term. This interaction may affect not only the levels of catch for the fisheries, but also the sustainability of those catches by fishers as well as constraining recovery of the population from adverse events. Thus managers must take such factors into account when designing strategies to meet the management goals of the fishery.

Challenges to Northern Fishery Management — In addition to the above environmental factors which affect the object of fishery management (i.e., the sustainable fishery), there are a number of challenges that fishery managers and resource users face. These include the biological complexity of the fish resource itself, and usually a significant lack of knowledge (especially scientific knowledge) regarding the fish population. The most commonly lacking critical pieces of scientific information are accurate estimates of the population size and the production parameters. This shortcoming makes decisions as to allowable (and sustainable) catch very tenuous and precludes even a reasonable level of understanding of the resilience or buffering capacity which may exist in the population. The biological complexity inherent in the situation often precludes even reasonable estimation of such parameters. Other challenges to northern fishery management include: multiple and possibly conflicting uses of fish habitat (e.g., rivers used as migratory pathways for fish, which are also dredged and used as transportation corridors for humans), economic issues such as marketability of the product from a northern fishery at a price which yields a reasonable return, and multiple co-management structures which may have different agendas and priorities.

Broad Whitefish of the Lower Mackenzie River

Broad whitefish (*Coregonus nasus*) is an arctic fish which exhibits a complex life history in the lower Mackenzie River (Figure 1) (Reist and Bond 1988, Reist and Chang-Kue 1997). Most of the factors noted above affect the population and management of this species, thus it serves as an instructive example with which to address management options.

Broad Whitefish Biology — Both partially anadromous (i.e., adults annually spend summers in estuarine or marine areas) and lacustrine (i.e., lake-dwelling) life history types are known (Reist and Bond 1988). Within each of these types, a number of biological populations exist, each possessing distinct characteristics and spawning in different locations (Reist 1997b in press). Adults of the anadromous populations migrate annually between upstream spawning habitats (primarily located within the Gwich'in and Sahtu Settlement Regions) and coastal feeding or overwintering areas (located in the Inuvialuit Settlement Region) (Figure 1). Individuals from several populations likely intermingle in the delta area and may be sequentially exploited by numerous fisheries during the fall migrations. Some populations, such as those spawning near Fort Good Hope, could be exploited by numerous fisheries operating within as many as three different land claim settlement regions. Juveniles of the anadromous type migrate downstream in the first year of life to reside in productive lake and creek systems of the Tuktoyaktuk Peninsula and outer Mackenzie Delta (e.g., Richards Island), and join the adult population at first sexual maturity between ages 7 and 9 years. The life history of the lacustrine type is less well-known but appears to be restricted to the local larger inland lake and river systems. Mixing of both life history types in certain

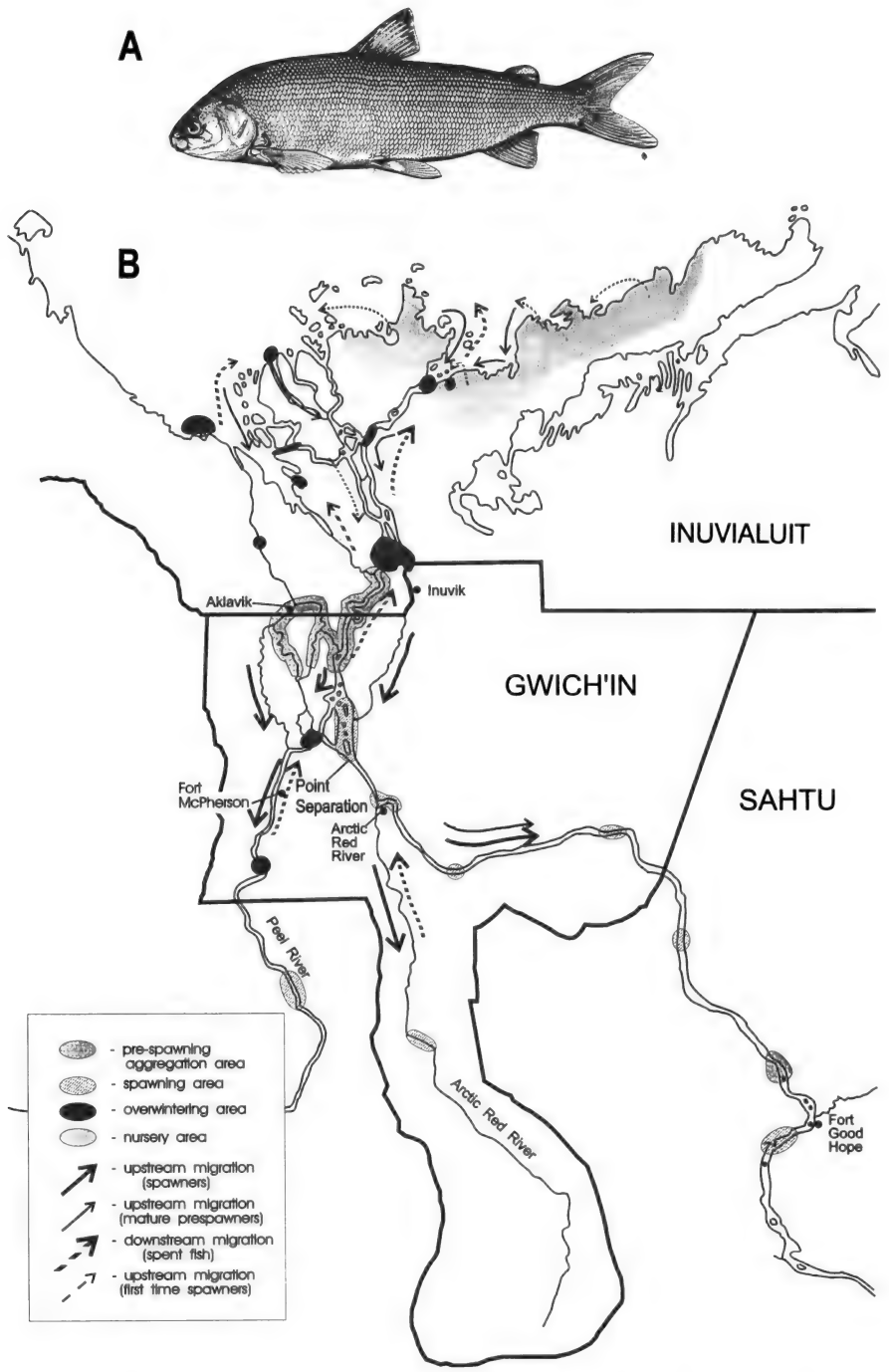

Figure 1. *The broad whitefish (A) and an overview of the life history (B) of the anadromous form in the lower Mackenzie River system.*

situations is also possible. Research efforts over the last 25 years have provided a greater scientific understanding of broad whitefish than any other fish species in this area. Our limited knowledge of the complex life history, key biological parameters, the impacts of factors such as climate change, and the trans-boundary migrations of the resource, greatly complicate the management of fisheries for this species.

Broad Whitefish Fisheries and Management — The subsistence fishery has been regulated by Inuvialuit, Gwich'in and Sahtu Dene and Métis custom and traditional knowledge (Freeman 1997). In addition to this subsistence fishery there have been sporadic attempts at commercial fisheries beginning in the mid-1900s (Figure 2). Export fisheries, whereby the product is sent to southern markets, were attempted between 1960 and 1966, 1972-75 and 1989-1993. Technical problems, poor market conditions, and competition with lake whitefish taken in southern fisheries, combined to limit the success of these attempts at commercial fishing (Anderson 1995, Davies *et al.* 1987). However, there continues to be a limited local commercial market. In 1975 the Department of Fisheries and Oceans became more involved in the regulation of the commercial fishery with the establishment of management areas and quotas (summarized in Treble 1996, Treble and Reist 1997). Then in 1989, 1992, and 1993 land claims were settled with the Inuvialuit, Gwich'in and Sahtu Dene and Métis, respectively. These claims stipulated that fisheries be managed jointly by local resource users and government, and co-management boards have since been established in each region. Members of the co-management boards are faced with the challenge of integrating two very distinct approaches to management, one based upon local, traditional knowledge and the other based upon fisheries science. For migratory species such as the broad whitefish, the land claim legislation requires government to coordinate management and research activities between jurisdictions. These processes and arrangements are currently being developed by the responsible partners.

Current Management Approaches

Current management of northern fisheries is usually based upon one of three types of knowledge — traditional, scientific, or exploratory fishery. The approach used depends on the size, type and significance of the fishery, the level of knowledge available, and the historical background of the fishery. Though these approaches are not exclusive, the tendency has been to apply them in isolation to specific fisheries (Figure 3A).

Fishery Management using Traditional Knowledge — Small local fisheries, especially those pursued for subsistence purposes only, e.g., on lacustrine populations of broad whitefish, essentially follow a traditional knowledge approach. That is, most such fisheries are not regulated to a significant degree by formal management agencies using scientific principles or information as the basis for decisions (although some general rules such as minimum mesh size for gill nets may apply). These fisheries are conducted by a small number of individuals, often only a family who fish for themselves but who may also share the catch within their community. Such fisheries tend to be sustainable over the long term so long as exploitation levels remain relatively constant at a level below the sustainable limit, and no significant outside factors influence the fish population. The knowledge base needed to manage such a fishery is local traditional knowledge which usually resides with the individuals most involved in the fishery — i.e., the fishers themselves. Because of the self-regulating aspect and single focus of such

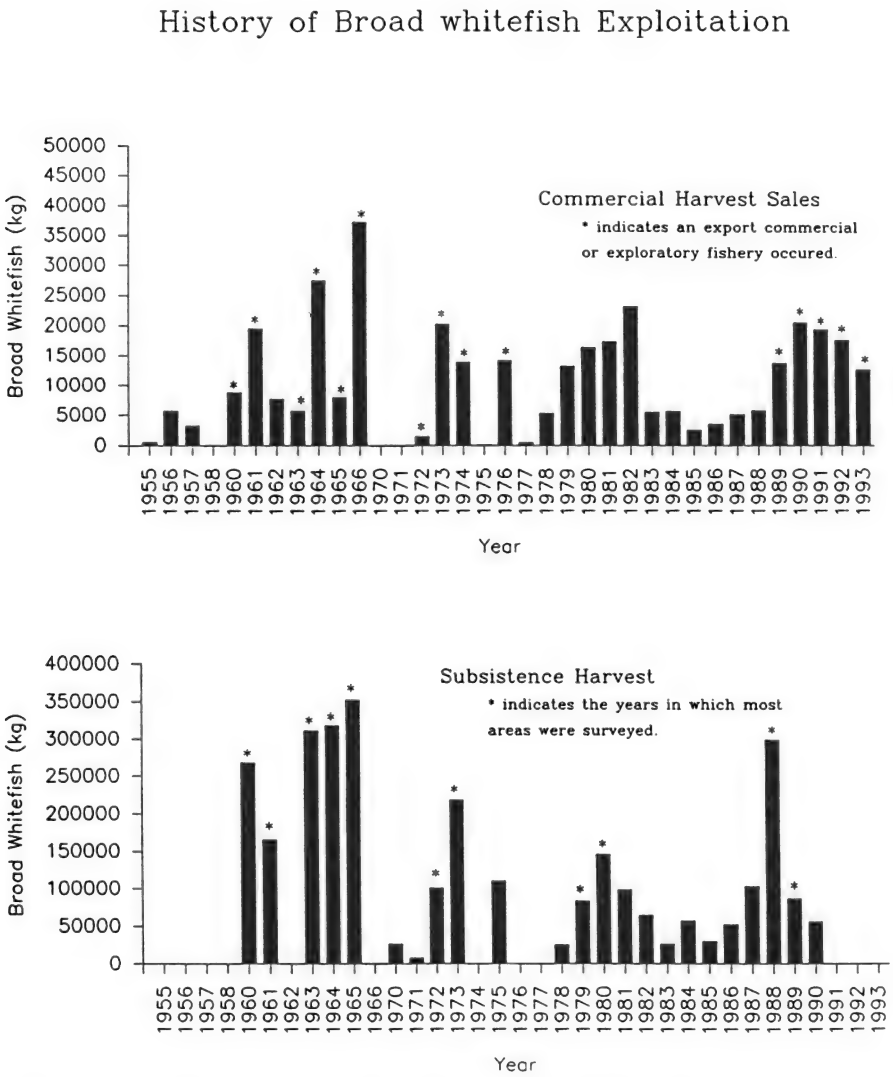

Figure 2. *The history of exploitation of broad whitefish for both commercial and subsistence fisheries from 1955 to 1993. Note the differences in scales on the y-axis.*

fisheries, significant levels of scientific understanding are not necessary to ensure their continued viability. However, scientific information may be required in addition to traditional knowledge if these fisheries become commercially exploited or vulnerable to impacts originating in distant areas (e.g., shifting productivity due to industrial or hydrological development, or climate warming). Commercial exploitation may occur in such fisheries if approved through a formal licencing process — in past years, a formal usually conservative quota would be set by the Department of Fisheries and Oceans,

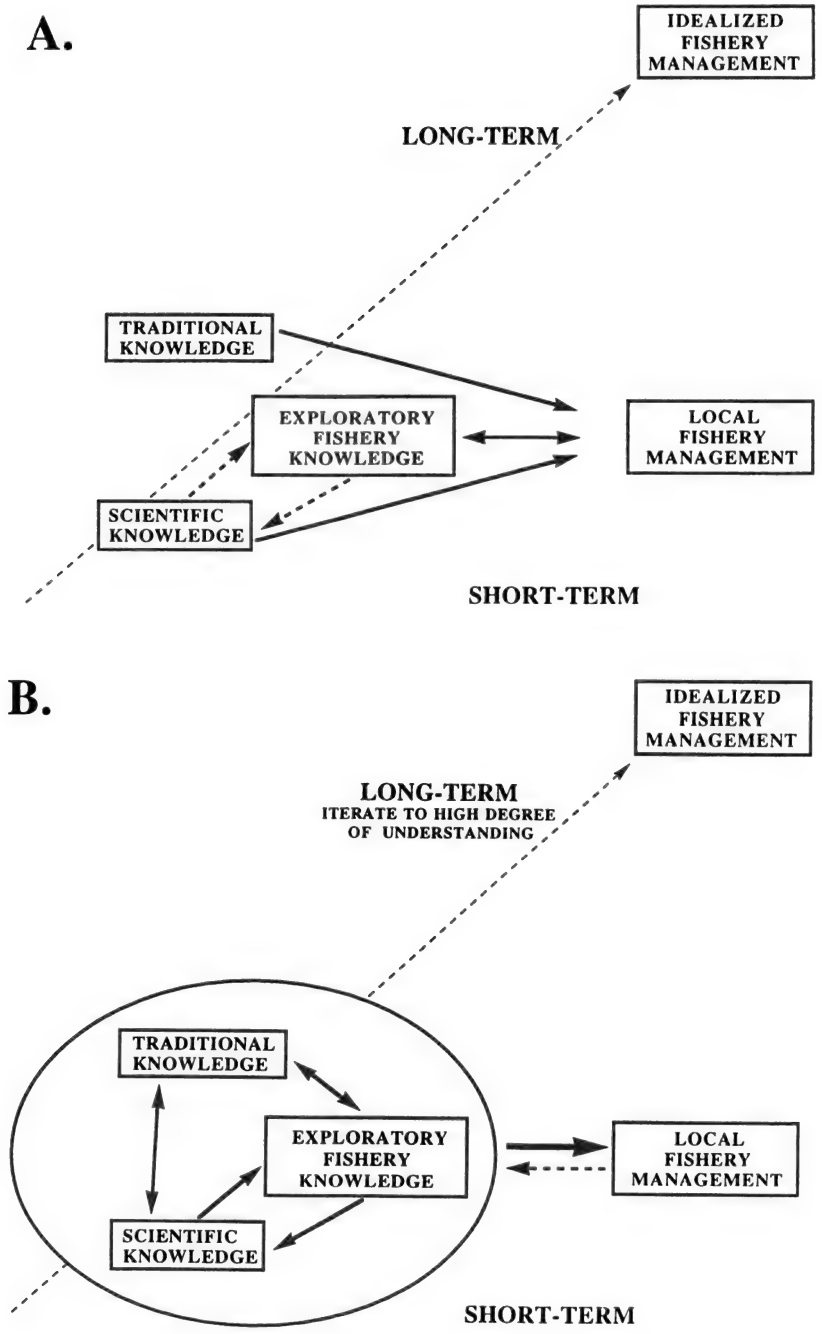

Figure 3. *A) Individual approaches to management of northern fisheries. B) A suggested integrated approach designed to iterate knowledge from all sources to enhance the accuracy of management actions.*

typically in the absence of substantial biological data. However, with the settlement of native land claims throughout the Arctic, this responsibility is being transferred to the formal co-management boards established through the settlement process.

Fishery Management using Scientific Knowledge — Formal management agencies generally use scientifically-based principles and theories for fishery management. To be effective, this approach requires substantial knowledge of the fish population. Such knowledge includes: accurate estimates of fundamental population parameters such as reproductive, growth, and mortality rates; population abundance; detailed knowledge of population life history, including which habitats are critical and occupied during which phases of life history. In order to set accurate catch limits, the size of immediately past catches must be known and combined with information on the replacement rate of the population. The effects of significant external factors such as exploitation, climate change, habitat alteration, contaminants, and so on must also be known with reasonable accuracy. Finally, all of this knowledge must be updated on a regular basis so as to accurately track changes in the population. In actuality, scientifically-based fishery management is conducted from less than adequate and incomplete data bases. A fundamental approach of scientifically-based fishery management is to establish a cycle consisting of the development of a biological knowledge base, execution and monitoring of the fishery, refinement of the knowledge base using the past results of the fishery and increased biological understanding. Another cycle of executing and monitoring the fishery follows this, and the entire process is repeated at regular intervals. In this fashion, an iterative learning process is established which ultimately will converge upon the ideal management scenario of routine application of accurate scientific knowledge in real time. Experience has shown that the lag time between the compilation of the required knowledge, the translation of that knowledge into useful management rules, and the application of those management rules to fisheries is usually so long that it loses its relevance. This is especially true for northern fisheries. This process of knowledge acquisition and application is also very costly, and for northern fisheries usually exceeds the value of the fishery by many times.

Fisheries such as those on the anadromous life history type of broad whitefish often involve multiple users from several groups, simultaneous domestic and commercial exploitation, and the exploitation of a number of biological populations as a mixed group. For such complex fisheries, the routine application of a wholly scientifically-based approach to fishery management is especially problematic. Such problems are often so significant that the regular application of scientific information to fishery management issues is simply not practical for any but the largest and most important fisheries. This leaves a void wherein some level of management beyond a traditional knowledge approach must occur, but full-scale scientifically-based management is not feasible.

Fishery Management using Exploratory Fishery Knowledge — A practical solution to the above problem has been the development of the exploratory fishery concept. Simply put, an informal experiment with respect to catch and population response is conducted by setting a limited (and hopefully conservative) quota. A biological data base is developed along with the fishery. The results are closely monitored and quotas adjusted as required. Such a fishery occurred for broad whitefish in the central Mackenzie Delta from 1989-1993. Analysis of this indicated that the increased exploitation from the

exploratory fishery did not significantly alter the structure of the population (Treble and Tallman 1997).

Treble (1996) suggests that the regular application of the exploratory fishery concept (as a management tool used to test the response of a population to varying levels of exploitation) is similar in many ways to the adaptive learning process or "adaptive management" described by Hilborn (1987), Holling (1978), and Walters (1986). We recommend that the concept of adaptive management be developed further for application to northern fisheries and offer the following ideas regarding this which could be adopted for application by co-management boards to small-scale commercial fisheries in the north. Such a procedure could stand alone for most fisheries. In large-scale commercial fisheries or those which present inherent problems, a greater focus upon typical scientifically-based fishery management could be undertaken.

Toward an Integrated Approach

As pointed out above, the overall present approach to management of most northern fisheries tends to be based exclusively upon one of the three knowledge bases outlined (Figure 3a). That is, due to a lack of knowledge, limited resources for collection of information, or both, little interaction or integration between the three knowledge bases occurs. This also tends to be the case for the few northern fisheries where more than one aspect of knowledge is available. Another aspect of the current approach is that feedback from the fishery management itself to the knowledge base is limited. As a result of this lack of integration, the possibility is limited to using the experience base from all sources of knowledge to achieve a closer predictive match between knowledge and effect (i.e., Idealized Fishery Management in Figure 3).

Co-management boards are striving to integrate western-based scientific management with the local or traditional knowledge held by fish harvesters. Many people feel that fisheries science is not able to provide answers to management issues, and suggest that the inclusion of traditional knowledge in an adaptive management framework will result in better, more informed management decisions (McDonald 1988). It could also be argued that the traditional knowledge based management system is a form of adaptive management as it is based on "a body of knowledge built up by a group of people through generations of living in close contact with nature" and is "...both cumulative and dynamic, building upon the experience of earlier generations and adapting to the new technologies and socioeconomic changes of the present" (Johnson 1992: 4).

As a model of a more integrated approach, we suggest the need to develop strong interactive linkages between the knowledge bases (Figure 3B). The integration of all this information into a coherent whole, and the use of this understanding as the basis for management decisions will provide a more fundamental structure to the management of the fishery. Feedback from management actions which are taken over a few years (i.e., the short-term) can be used to further integrate knowledge and enhance the accuracy of management actions. By conducting this process over the longer term, the predictability associated with a management action is enhanced. In other words, our understanding of the system begins to iterate over time to a closer relationship between management action and predicted response, thus approaching the ideal (Figure 3B).

The management of broad whitefish is perhaps the most advanced situation where the integration of these three approaches into management recommendations has been achieved for a northern fishery. There are additional examples of smaller fisheries

where similar progress has been made. (eg., Dolly Varden char from Yukon north slope rivers.) However, there is still much to do before an ideal integration and interaction can be achieved:

> Fisheries science and Traditional Knowledge are both evolving and changing. As more information is gathered and evaluated, practices are modified or new ones developed. With the development of the co-management process to include more traditional knowledge, fisheries science and the concepts of traditional knowledge will become more familiar to fishers and scientist, alike. They will effect changes in each other and in the approach to fishery management. (Treble 1996, p. 109).

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The Development of a Habitat Suitability Index for the Ringed Seal (Phoca hispida) in the Canadian High Arctic

Theresa Nichols[1], Stuart Innes[2], and David Barber[3]

The arctic hydrocarbon and geological discoveries of the early 1970s prompted transportation and environmental assessments within the Canadian Archipelago. Included in these evaluations were population studies of the ringed seals, *Phoca hispida*. This species was selected due to its extensive circumpolar distribution north of 50° N, large population size, and relative ease in locating by aerial surveys during the basking season (Frost and Lowry 1981, Smith and Stirling 1975). Understanding the dynamics of this species is also directly relevant to the Inuit who depend on the ringed seal for their cultural identity and diet. Due to its central importance to the Arctic food web, the abundance and distribution of ringed seals could serve as biological indicators of overall arctic productivity and health (Stirling and Øritsland 1996). The current population estimate for ringed seals is about 2.7 million in the Canadian Arctic based on the caloric needs of polar bears (Stirling and Øritsland 1996), while estimates based on basking seals seen during late June and early July surveys are much smaller. Correction factors to account for seals remaining submersed during surveys are variable. Finley (1979) reported basking ratios represented up to 70% of local populations based on daily haul out patterns. Smith and Hammill (1981) determined estimates varied from 23%-80% in response to changing weather and light conditions. Removal sampling techniques (Hammill and Smith 1990) further determined aerial surveys could be underestimating populations by 1.3 to 1.9 times.

The abundance and distribution of ringed seal populations are thought to be largely controlled by the availability of prey and suitable breeding habitat (MacLaren 1958). Identifying subnivean habitat over the winter season provides information regarding population densities and the nature of physical parameters composing preferred habitat.

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Successful reproduction in this species requires that several factors be met. First, ringed seals require an ice platform on which to give birth. Second, the pup requires adequate protection from the harsh winter until it has developed its waterproof pelage and enough fat reserves to avoid hypothermia while in water. Finally, sufficient snow cover is required to protect the pups from bear and fox predation (Furgal *et al.* 1996). Ringed seals have evolved, behaviorally and physiologically, to take advantage of the protection afforded by snow distributed on the sea ice surface. By actively clawing through the ice and excavating snow drifts, ringed seals effectively exploit their environment.

Population counts frequently employ systematic strip transect aerial surveys during the basking season (see Frost *et al.* 1988, Kingsley 1986, Lunn *et al.* 1997, Stirling *et al.* 1977, 1982). Stratification of habitat is advantageous to the population assessments as distribution of ringed seal habitat is not uniform over the sea ice surface; instead, high quality habitat is clumped near leads, pressure ridges and multi-year/first year ice interfaces. Through stratification, precision of the estimates can be improved when the intensity of sampling is proportional to the standard deviation of animals per sampling unit within the stratum (Neyman 1934 as cited in Caughley 1977, Tschuprow 1923). Stratified surveys by habitat variables provide another quantitative technique for large Arctic areas. The development of a habitat suitability index does not propose to increase the accuracy of population estimates; rather, it seeks to stratify vast areas of sea ice into homogeneous strata based on habitat potential.

Objectives

In this paper we limit our analysis to a quantification of the physical habitat parameters and the identification of relationships amongst the snow/sea ice physical characteristics which define ringed seal habitat. This index does not suggest that distributions will necessarily be found within these areas; instead, it will highlight regions that contain elements of moderate to high habitat quality. Combining estimates from areas of greater habitat potential could provide more precise estimates, with flight time and money expended more efficiently. The future objective will be to relate the physical variables assumed relevant to habitat with features extracted by synthetic aperture radar (SAR) data, ultimately producing a map product displaying areas of high, moderate and low habitat potential.

Materials and methods

Study Site — Field work was conducted at two separate sites within the Canadian Arctic Archipelago. Research was conducted at the junction of Admiralty Inlet and Strathcona Sound, NWT (73°15'N, 85°15'W) between April 2 and June 9, 1992. Admiralty Inlet is bounded primarily by the Pre-Cambrian geology (Pre-Cambrian sandstones and shales with some exposed basalt and granite) of Baffin Island. Land elevations in this area are the highest in the Canadian Arctic Archipelago, with Devon, Baffin, and Bylot Islands generally ranging between 700 and 1500 meters (Gorman 1988). The second field season was conducted on Barrow Strait, NWT (74°30'N, 96°50'W) between April 5 and May 8, 1995. The Barrow Strait site was situated east of Lowther Island and southwest of Cornwallis Island. Landmass within this location is dominated by flat topology of Cambrian sedimentary origins with elevations between 100-250m, in stark contrast to its eastern neighbour (Gorman 1988). The flow of water in Barrow Strait is not restricted by landmass, flowing freely through Peary Channel Resolute Passage, Peel Sound, and Wellington Channel.

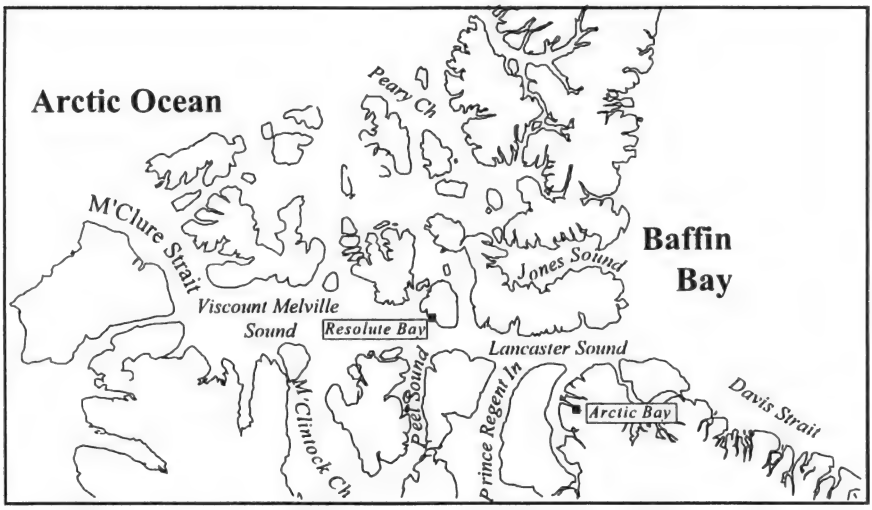

Figure 1. *Map of the Canadian Arctic Archipelago.*

Synoptic Climatology and Geophysics

To establish variables required for habitat description, systematic environmental sampling was conducted. The first objective of these surveys was to establish the general nature of the local environment. The second objective was to quantify physical variables associated with actual subnivean lairs located within the surveyed environment. From these results, more rigorous analyses of habitat requirements were conducted.

Climate data were incorporated to investigate the influence of temperatures and snowfall on habitat suitability. Climatic variables were derived from the nearest hamlets of Arctic Bay and Resolute Bay (Table 1). Climate data from the onshore sites were used to infer climate effects over the offshore sites. Arctic Bay (73°02'N, 85°09'W) is situated on the west coast of Baffin Island, northeast of the intersection of Admiralty Inlet and Adams Sound. Monthly temperatures and monthly snowfall are averaged for the years of 1956-65 and 1975. Data are limited to these years based on availability. Nanisivik (72°59'N, 84°37'W) temperature data were also included to determine temperature norms for the area, but were not used directly to infer offshore conditions in Admiralty Inlet. Snowfall data from Nanisivik were entirely disregarded due to the influence of elevation. Resolute Bay (74°43'N, 94°59'W) is located at the southern end of Cornwallis Island near the intersection of Barrow Strait and Resolute Passage. Resolute Bay provided the most comprehensive data, of which a 30-year climate summary was established for the years 1965 to 1994.

Temperatures were found to increase southerly and easterly in a counter-clockwise direction across the Archipelago. Annual average temperatures of -14°C in Arctic Bay were calculated (1956-64 and 1974) compared to lower temperatures of -16.7°C in Resolute Bay (1965-94). Temperatures during 1992 for Arctic Bay were not available; however, temperatures were within normal parameters for Nanisivik, suggesting nor-

Table 1. *Monthly temperature(C) and snowfall averages(cm) for Arctic Bay and Resolute Bay, NWT. (Environment Canada)*

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Arctic Bay												
Mean Temp	-29.21	-29.86	-28.67	-20.09	-8.64	1.77	5.55	4.16	-2.02	-12.58	-21.84	-26.89
Ttl Snowfall	5.74	4.26	3.77	4.04	5.40	2.63	0.20	2.73	12.95	14.10	5.87	4.44
Resolute												
Mean Temp	-32.29	-32.97	-31.09	-23.67	-12.14	-0.59	4.09	1.78	-4.90	-14.82	-24.71	-29.25
Ttl Snowfall	22.57	22.73	24.33	25.93	28.10	17.00	0.13	0.00	5.57	15.50	20.20	22.33

mal conditions existed within the proximate area. Resolute Bay, 1994-1995 also indicated normal temperature conditions within the central region.

Habitat Surveys

In Admiralty Inlet, 1992 systematic environmental sampling recorded data along parallel transects 100 meters apart. The measurements included snow depth, snow depth at 10 one metre intervals perpendicular to the transect line, distance and azimuth to the nearest ice ridge, height of the nearest ridge and thickness of the ice in the nearest ice ridge. Due to large areas of flat first-year ice, distance measurements were not continued beyond 30 meters.

The Barrow Strait site followed an alternate systematic sampling technique. A designated grid of parallel 2.0 km transects spaced every 0.5 km was established. Along these transects, samples were collected every 100 m. Site location was selected prior to the survey using ERS-1 (Earth Resources Satellite-1) imagery. The selected study area intentionally included several ice types and varying geometry. Data collected at each site were identical to those collected in 1992.

Lair Sampling

Lairs were found by trained scent-tracking dogs (Smith and Stirling 1975). The habitat areas were repeatedly searched with the dogs to find most of the lairs. The dogs conducted each search either upwind or cross-wind. Observers-handlers followed on

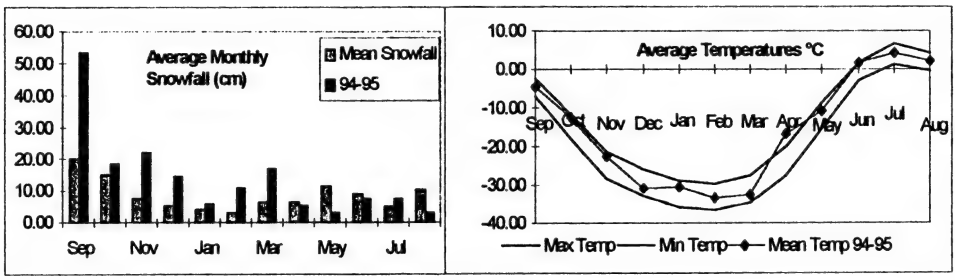

Figure 2. *Resolute Bay Climate Data: 1994-95 compared to average minimum and maximum temperatures, and total monthly snowfalls.*

Figure 3. *SAR with transects superimposed to illustrate sampling survey method.*

foot. During the 1992 season, two retrievers, Brandy (black labrador) and Rega (golden retriever), were used, while only one trained black female labrador, Beebop, was used during the 1995 season. Time searched per strata varied with the success of the dog(s) in detecting subnivean structures. Time spent on strata of flat first year topography was the lowest time per unit area, while strata which incorporated ice deformities, specifically ridges was the more time-consuming. Seal-created structures that were found after a significant rise in the ambient temperatures causing sagging or collapse were excluded in the analyses (Furgal *et al.* 1996).

The location of each lair was determined using a global positioning system (GPS). Admiralty Inlet lairs were recorded using an Ashtec XII (Ashtec Inc., Sunnyvale Ca. 1991) while Barrow Strait lairs were positioned using a hand-held GPS (Scout Master, Trimble Navigation Ltd., Austin, TX.). The immediate area surrounding the lair was examined, and physical features associated with it identified. "Ridges" were defined simply as protrusions of ice resulting from failures induced by compressive, tensile, or shear forces. The range of deformations varied from small blocks projected above the immediate ice surface, to linear features delineating the ice edges, to elevated first-year pressure ridges at multi-year ice perimeters. Ridge height was defined as the vertical separation from the top of the ridge to the surrounding ice surface. Distances between the deformation and the closest edge of the lair, block height and ice block thickness

were measured using a graduated measuring probe. Schematic drawings were made of each lair and surrounding ice.

Graduated metal probes were employed to determine lair dimensions and shape (± 5 cm), interior heights (± 1 cm), roof thickness (± 1 cm), and breathing hole dimensions (± 1 cm) (Furgal *et al.* 1996). Internal variables were used in conjunction with circumstantial evidence to define lair types. An examination of ice rinds and the status of the breathing hole (open or frozen) allowed lairs to be further classed as active or abandoned. External variables were employed to quantify spatial relationships between lair locations and physical features within the environment, i.e., ridge height, block thickness, lair-ridge distances. Attempts were made to minimize any damage to the lairs during inspection, and upon completion of the measurements, lairs were reconstructed whenever possible. Admiralty Inlet data were collected by S. Innes who also acted as the instructor for the collection of the Barrow Strait data.

Data Analysis

Distributions were viewed to detect deviations from normality and homoscadasticity (Figure 4). Where distributions were non-normal, transformations were employed. Transformations were conducted to normalize data using square root or natural log functions. All tests were two-tailed, and α was set at 0.05. Statistical testing was conducted using StatView 4.02 (Abacus Concepts Inc., Berkeley, CA) and Data Desk (Data Description Inc., Ithaca NY).

Analysis of Variance (ANOVA) tables were constructed to test for climate difference between years for Arctic Bay (1956-65; 1975) and Resolute Bay (1965-1995). Comparisons between Admiralty Inlet and Resolute Bay environmental variables were conducted using unpaired t-tests (α=0.05). Unpaired comparisons were also applied to habitat structure types with respect to their appropriate years. Due to the different conditions of the two research sites, data are blocked by both type and year.

Linear regression analysis was used to investigate relationships between physical variables, including ridge height, ice thickness, snow depths and lair-ridge distances. Multi-year ice data are excluded from these preliminary analyses due to structural and chemical differences between first-year and multi-year sea ice. Durbin-Watson tests were employed for testing normality, and data were transformed where appropriate. Stepwise regression analyses were incorporated to investigate multiple relationships between variables, where snow depth was considered dependent. Breathing hole data were not included within regression analyses.

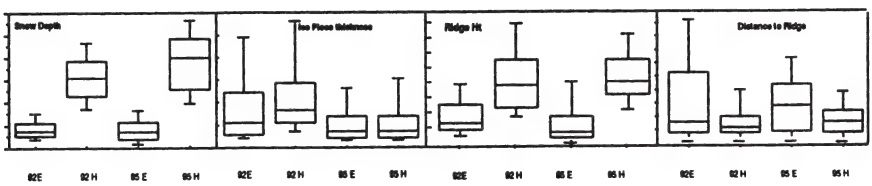

Figure 4. *Box plots are used to display the distributions of the snow depth, ridge height, ice piece thickness and distance to ridge. Boxes are divided into medians and quartiles. The 10 and 90% values are displayed by the lines extending horizontally in the box plots.*

Results

All variables within the environmental surveys displayed non-normal distributions. Within habitat surveys, only distance to ridges and ice thickness were skewed. The thickness of the ridged ice reflects the thickness of the sea ice at failure. Ice thickness in ridges averaged 8 cm at Admiralty Inlet, significantly higher than the 5 cm average in Barrow Strait ($F_{[1,219]}$ =10.119; p=0.002). Ridge heights were determined to be significantly higher within Admiralty Inlet ($F_{[1,221]}$=11.582; p=0.001), with a positive relationship found to exist between ice thickness and ridge height. No differences in snow depths between Admiralty Inlet and Resolute Bay were statistically detectable ($F_{[1.636]}$=0.748; p=0.3875). Distance from the sampling points to the nearest ridges were not statistically distinguishable between sites ($F_{[1,178]}$=0.100; p= 0.7408). These data were censored at 30 meters. In total, 52% of environmental samples in Admiralty Inlet (n=197) and 16% of sites in Barrow Strait (n=441) were found associated with ridges at a 30 m radius. Tightening the distance radius to 10 m further reduced these percentages to 38% and 11% respectively. These results further suggest a much rougher sea ice topography at the Admiralty Inlet site than Barrow Strait.

Habitat (Lair) Sampling

The Admiralty Inlet site covered 114 km^2 (Furgal *et al.* 1996) although the core sampling area was smaller, while the Barrow Strait site encompassed 20 km^2. The core areas were surveyed several times during the duration of the study to minimize the lairs not detected on individual surveys. A total of 215 habitats were located, of which 169 were subnivean structures and 55 were breathing holes. A breakdown of subnivean lairs determined 109 to be haul out, 46 as nursing/pup lairs and 5 classified as 'other'. "Other" included 3 complex lairs and 2 possible escape lairs. It was assumed that not all lairs were located due to the abilities of the dogs to track each seal scent. Errors introduced by individual dog ability and weather conditions were noted, although no actual correction values were calculated.

Snow depths were determined to be significantly less over breathing holes than haul out and pup lairs. Differences between snow depths were not distinguishable between haul out and pup lairs (Table 4). All lair structures were found to be approximately equidistant from the ridge features, averaging less than 4.0 meters. Associated ridge height averages were greater within the haul out and pup lair distances than breathing holes, but were not statistically distinguishable between actual lairs. Ice thicknesses were not found to be different between any of the habitats.

Differences between Habitat Type

Snow depths at the seal lairs (breathing hole and basking hole data were excluded) were found to be deeper on Barrow Strait than those on Admiralty Inlet ($F_{[1,236]}$=10.951; p =0.001; Table 1). Ice piece thickness was thicker within Admiralty Inlet ($F_{[1,195]}$=4.933; p =0.027; Table 1). Distances between the subnivean lairs and the nearest ridges were not statistically significant between sites ($F_{[1,220]}$=0.063; p =0.8015; Table 1). Of lairs located, 99% at Admiralty Inlet and 85% at Barrow Strait were within a distance of 30 meters to the nearest ridge. Decreasing the radius to 10 meters calculated a slight reduction in lair detection (90% and 79%). Seal structures were predominantly associated with ridge heights greater than 1.0 m. Ridge heights were not statistically different between the lair types (p =0.3956). The minimum ridge height threshold was deter-

Table 2. Snow depth, distance to the nearest ice ridge, thickness of the ridge and ridge height sampled from both the representative environment and habitat sites for 1992 (Admiralty Inlet, NWT) and 1995 (Barrow Strait, NWT).

Environmental Data	Trans-formation	1992 Admiralty Inlet	1995 Barrow Strait	Comparisons $\mu 1$-$\mu 2$; α=0. 05
No. of samples		197	441	
Snow Depth	sq. root	0.16	0.16	Fail to reject p=0.3115
Nearest Ice Ridge	sq. root	6.01	6.33	Fail to reject p=0.7408
Ice Piece Thickness	ln	0.08	0.05	p=0.0024
Ridge Ht	ln	0.64	0.55	p=0.0021
Habitat/Structure Data		**1992 Admiralty Inlet**	**1995 Barrow Strait**	**Comparisons $\mu 1$-$\mu 2$; α=0. 05**
No. of samples		177	57	
Snow Depth		0.63	0.76	p=0.0063
Nearest Ice Ridge	sq. root	3.33	3.67	Fail to reject p=0.5129
Ice Piece Thickness	ln	0.12	0.09	p=0.0321
Ridge Ht		1.05	1.12	Fail to reject p=0.3956

Table 3. Suitable habitat percentages based on minimum threshold requirements.

	Nearest Ridge £30 m	Snow depths > 0.35	Ridge Height ^{3}0.35m	Ridge Height 0.35 and Nearest Ridge £10.0 m
Admiralty Inlet				
Environment	52%	7.6%	52%	19%
Habitat	99%	94%	95%	84%
Resolute Strait				
Environment	16%	9.3%	36%	3.6%
Habitat	85%	100%	100%	79%

Table 4. Measurements (m) of ringed seal structures located in Admiralty Inlet NWT, 1992 and in Barrow Strait, 1995.

Internal Variables	Breathing Holes (B)	Haul out Lairs (H)	Pup Lairs (P)	Differences p<0. 05
Number of Structures	55	109	46	
Roof Thickness	0 40±0. 18	0.40±0.18	0.48±0.26	Fail to reject
Internal Height	0.17±0.12	0.31±0.13	0.33±0.12	BH BP
Lair Length	0.61±0.08	1.7±0.53	2.27±0.87	BH BP HP
Lair Width	0.55±0.04	1.23±0.37	1.45±0.6	BH BP HP
Breathing hole diameter (major axis)	0.47±0.07	0.48±0.12	0.61±0.16	BP
External Variables				
Snow depth	0.49±0.26	0.73±0.24	0.8±0.28	BH BP
Nearest ridge	2.90	3. 25	3.75	Fail to reject
transformation *ln*	1.064±0.88	1.178±0.76	1.322±0.71	
Ridge height	0.68	1.08	1.11	BH BP
transformation *ln*	-0.392±0.70	0.076±0.52	0.107±0.47	
Ice thickness	0.10	0.12	0.14	Fail to reject
transformation *ln*	-2.261±0.89	−2.161±0.89	−1.941±0.64	

Ice thickness: Multiyear is removed
Hole diameter: <15 cm were ignored.

mined to be 0.35m, in which 94% of lairs in Admiralty Inlet and 100% of lairs in Resolute Strait were located. Habitats located outside these physical parameters (lower ridge heights or greater distances from ridge features) were likely occupied by juveniles or non-breeding adults since they did not have either *tiggak* (rutting male odor) or *lanugo* (embryonic pup fur) associated with the lair.

Relationships between Physical Variables

Sufficient snow depth is a primary factor determining whether a snow drift is suitable for habitat construction. However, snow depth cannot be accurately assessed from remote sensing platforms (Barber *et al.* 1993) although modeling snow distribution as a function of ice topography shows considerable promise (Iacozza and Barber 1997). In this work it is more practical to relate snow depth to surface features influencing the nature of drifting. Using stepwise regression, we linked snow depths with other environmental variables. Individual variables were assessed for their contributions to

Table 5. Results compiled using regression analysis where snow depth is considered dependent (y) and ridge height independent (RH). Regression equations are in the form y = ax + b.

Environmental data blocked by year		1992 Admiralty Inlet	1995 Barrow Strait
Regression Equation		0.463+0.43RH	0.598+0.117RH
R^2		0. 089	0.337
Habitat Data blocked by function	**Breathing holes**	**Haul out**	**Nursing**
Regression Equation	0.307+0.288RH	0.126RH+14. 577	0. 274RH+0. 483
R^2	0.325	0. 101	0. 350

Table 6. Results compiled using regression analysis where ridge height is considered dependent (y) and ice thickness independent (IT). Regression equations are in the form y = ax + b.

Environmental data blocked by year	1992 Admiralty Inlet	1995 Barrow Strait
Regression Equation	0.431IT + 0.054	0.688IT + 0.582
R^2	0.255	0.462

the relationship, but were rejected if they added no significant improvement. Only ridge height was found to be a consistent factor on snow depth (Table 5). In turn, ice thickness was found positively related to ridge height (Table 6). Several studies have previously reported strong positive correlation between ice thickness and ridge height, substantiating this relationship (Furgal *et al.* 1996, Parmeter and Coon 1973).

Discussion

Admiralty Inlet and Barrow Strait typically produce high quality ringed seal habitat, evidenced by the high concentrations of seals that overwinter within these areas and the high density of nursing seal lairs. Snowdrift distribution and abundance appear key to ringed seal habitat. Snow distribution is a function of snow type, wind, and surface roughness (Verge and Williams 1981). Snow type refers to the snow grain structure and density, which is subject to ongoing change throughout the winter. Temperature plays an important role, governing the rate of metamorphosis of grain structure, cohesion, and density (McKay and Gray 1981). Dry snow is less dense, thereby subject to easier eolian transport than heavier wet snow. Snow is transported primarily by

saltation, where snow is rolled or bounced along the surface. Increased temperature and saltation act to reduce grain size, producing rounder, more dense grains which can be packed tighter together at the surface (Langham 1981). The degree of cohesion of the grains primarily dictates drifting potential. Although most drifting occurs during snowfall, surface grains are also transported with sufficient wind strength which exceeds stress thresholds. Deposition of drifting snow occurs as wind speed slows, often as a result of obstacles which impede the flow. Storm events characterized by strong winds from a single direction produce the deepest drifts in areas over dry, unconsolidated snow (McKay and Gray 1981).

Snow depth averages within the Admiralty Inlet and Barrow Strait environments were both approximately 16 cm. Average snow depths associated with lairs were determined to be significantly deeper than their surroundings, at 63 cm and 76 cm ($p<0.0001$), respectively. Ridge height was determined to be a factor contributing to the surrounding snowfall depths. The significance is variable due to the geometry and orientation of the ridges, the prevailing wind direction and wind strength, and the kinematic structure of the snow grains (as mentioned previously). Over sea ice, ridges act as obstacles resulting in reduced wind speeds and subsequent snow deposition. The location and shape of the drift is related to wind speed, cohesion of the snow particles and the shape, size and orientation of the ridge with regards to wind direction (Verge and Williams 1981). Ridges oriented crosswise to the winds are expected to develop the highest accumulations along the lee and windward slopes, while those parallel to the prevailing winds have the shallowest snow accumulation. Distance from the ridge also appears to influence the degree of snow depth, although no mathematical relationship was defined.

Within Admiralty Inlet and Barrow Strait, over 94% and 100%, respectively, of subnivean lairs were located in snow drifts greater than 35 cm. Although there is a substantial lack of snowfall during the ice covered season, northern Admiralty Inlet's proximity to the shear zone (produced by Lancaster Sound's eastward movement against the landfast ice of Admiralty Inlet) results in an abundance of ridges, which act as catalysts to developing snowdrifts, even under low snowfall conditions. The Barrow Strait site did not lack snowfall; however, its ridge abundance is substantially less, resulting in unimpeded drifting and fewer suitable drifts per unit area. Using the minimum required snow depth of 35 cm, only 7.6% of the overall surveyed area in Admiralty Inlet, and 9.3% of Barrow Strait would meet this minimal ringed seal lair habitat criterion.

Consolidation of the northern Admiralty Inlet takes place in late November. Movement of ice eastward through Lancaster Sound induces pressure and shear ridges to form along the Baffin and Bylot coastlines. As well, the shear zone extends across northern Admiralty Inlet and Navy Board Inlet where fast ice intersects with pack ice. By spring, these shear ridges reach several meters in height (Gorman 1988). Continuing movements of Lancaster Sound pack ice produce very extensive, heavily deformed areas. Admiralty Inlet ice fractured at a later stage of development (i.e., older and thicker) than ice in Resolute Strait. This may be a result of the protection offered to Admiralty Inlet by the surrounding landmass. In contrast, Resolute Strait is subject to the rapid currents and continual flushing of ice eastward along Lancaster Sound. However, in both locations the ice piece thickness associated with lairs were significantly greater (Table 2) than the surrounding environment. The most likely explanation for this rests with the relationship between ridge height as a function of ice thickness

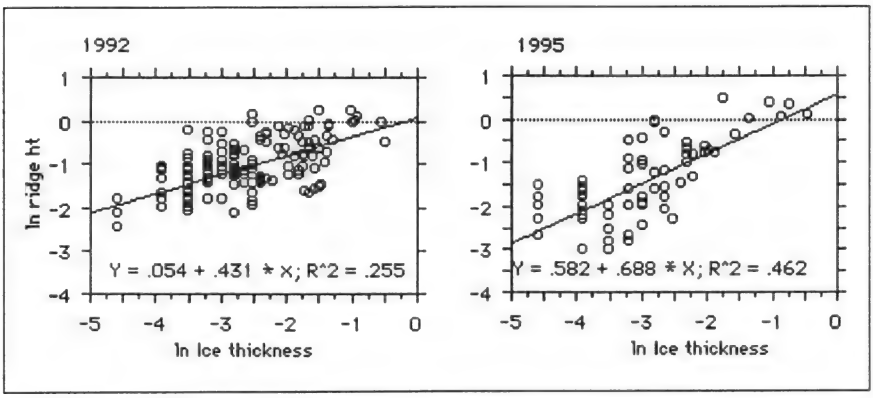

Figure 5. *Graph of ice thickness and ridge height*

(Furgal *et al.* 1996, Parmeter and Coon 1973, this paper). Simply put, higher ridges are composed of thicker ice which catch more snow to form thicker drifts.

Environmental parameters, specifically climatic and hydrographic conditions, were distinct between these two locations. The dominant high pressure cell (continental Arctic) residing over the Arctic Ocean greatly influences temperature and the amount of precipitation available to the western and central regions during the winter. As a result of this system, clear and cold conditions often exist throughout the winter. Using cumulative snowfall data (Sept.-June) collected at several Arctic climate stations, the general trend of cumulative snowfall also increases southward and eastward. This is aided in the east by the low pressure system (maritime Arctic) which, although less prominent in winter, provides warmer temperatures, higher relative humidity and increased precipitation (Gorman 1988). The obvious exception is Arctic Bay which receives one of the lowest annual snowfall averages of any of the Arctic communities. The significant cliffs adjacent to Admiralty Inlet alter local weather patterns. Thus, Arctic Bay has an annual average snowfall of 66.1 cm compared with Pond Inlet, located on the east side of the mountains, which averages over twice the amount (143.5 cm). Nanisivik snowfall could not be included to assess snowfall conditions within Admiralty Inlet due to significant precipitation variability at increased elevations. Resolute Bay averages an annual cumulative snowfall of 105.2 cm, although research year 1994-1995 showed much greater levels of snowfall, averaging 170.1 cm (Sept. 94-June 95; Environment Canada). Climate data extracted from nearest onshore sites were used to infer conditions over sea ice sites, although the reader is cautioned that energy balances over water *versus* that over land are not identical, and as such, cannot be implemented to directly represent the climatic regime offshore.

Defining habitat strata based on environment and ice types

Preliminary stratification should take into account the importance of landfast first-year ice as a habitat foundation. This primary key eliminates areas dominated by pack ice, considered here as unsuitable or less preferred habitat for the ringed seals. It has been found that consolidation dates were a highly influential factor determining suitability.

Ringed seal movement were reported to follow ice edge during the freeze-up season. This may be, in part, related to potential increases in prey density near the ice edges (Bradstreet and Cross 1982) or reduced energy expenditures to maintain breathing holes. Annual consolidation dates were found in several studies to be highly variable, as indicated in Gorman's (1988) work as well as within the Sea Ice Atlases. Tracing the movement of the ice edges during freeze-up is expected to play a large role in determining suitability, and must be included when developing the suitability index. Geometry of the surface will be considered the third major contributor to habitat. Remote sensing technologies (specifically SAR) will be key to detecting these features, by altering the direction and strength of the backscatter along the ridges. As the majority of lairs were located in association to the ridges, a 30 meter distance from the ridges will be included within the habitat variables. Snow depth is not yet differentiated sufficiently to include it as a stratification variable, however its close association to ridges make it unnecessary.

Large pans of multi-year ice were not encountered within the Admiralty Inlet site, but did account for a portion of the Resolute Strait site. Multi-year ice is defined as having survived at least one melt season, differing from its first-year counterpart both structurally and in composition. The thickness (typically over several meters) and hardness of the multi-year ice make it unsuitable as a subnivean habitat foundation. Where areas are dominated by multi-year ice (detectable in remote sensing applications such as SAR), habitat may be considered to be limited northwards. In fact, areas north of 84°N contain multi-year concentrations over 75% (Gloersen *et al.* 1992). During our study, multi-year ice floes were not found to contain any habitat within the floes themselves. However, repeated failure of first-year, thinner ice sheets did occur along the edges of the multi-year year floes, resulting in deformations of first-year ice which often surrounded the floes. Therefore, although multi-year ice is rejected as suitable, its periphery is often high quality habitat where several birthing lairs were found in our study.

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Namay: A Northern Resource in Crisis

Terry Dick[1], Henry Letander[2], Kim Morrisseau[3], and Chris Paci[4]

Namay, the lake sturgeon, is an ancient freshwater fish that has a long association with First Nations of North America. Within some of these communities, particularly the Cree and Ojibwe in northern Ontario, Manitoba, and Saskatchewan, sturgeon was used for food, glue and containers (sturgeon skins) on a sustainable basis (Fig. 1). Despite its high value to First Nations and early fur traders and explorers, the early settlers had little interest in sturgeon and considered it a nuisance fish which damaged their fishing nets (Dick and Choudhury 1992). A decline in the important sturgeon fisheries of Europe and Russia, however, placed considerable pressure on the North American fisheries in the late 1800s for caviar, meat, isinglass, and leather. This was the 'beginning of the end' for the great lake sturgeon populations of Canada. So great was the fishing pressure that entire populations were decimated in about 10 years (Fig. 2), never to recover. A few small commercial fisheries survived, off and on, in Manitoba and Saskatchewan up to the mid 1990s. With the exception of the Saskatchewan River at Cumberland House in Saskatchewan, and the Fox, Bigstone, and Stupart Rivers in Manitoba, all are now closed.

Following the destruction of the sturgeon fishery, there was no concerted effort to manage the species; and as stated by Dick and Choudhury (1992), "if the next 100 years sees as little progress in our understanding of the biology of lake sturgeon, as the past century has, its future does not look too bright". A research program on lake sturgeon started in 1989 at the University of Manitoba and it was quickly found that there were significant gaps in contemporary knowledge, especially as it related to specific river systems. The major river/lake systems, more often than not, were significantly altered with hydroelectric dams, impoundments, and reduced flows downstream, such that there was significant habitat alteration and loss for lake sturgeon. Consequently, there

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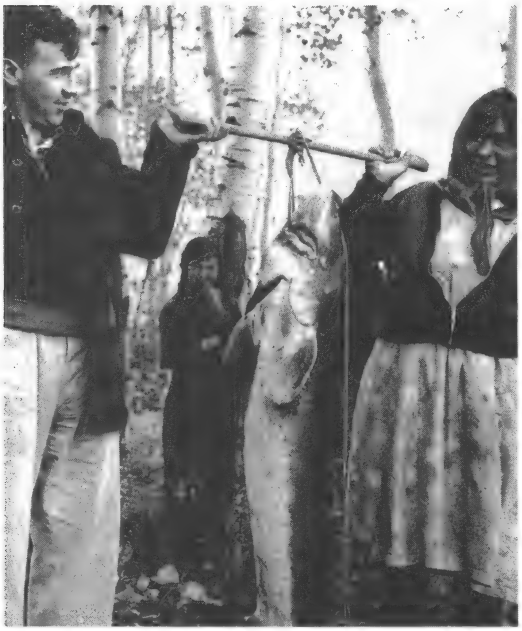

Figure 1. *Sturgeon caught by Cree in the Albany River near Fort Hope, Ontario (L. Yorki Fisgar, district forester at Geralton, Ontario [c 1944]. Photographer: Jack Hamilton, Hudon Bay Company Archives (HBCA) photograph collection 1978/363-F3/2. HBCA, Provincial Museum of Manitoba, Winnipeg.*

is little point in developing a long-term management strategy for lake sturgeon unless there is a better understanding of these systems, past and present. It is the view of the authors that any long-term management plan must include indigenous knowledge of the fish and the aquatic system as well as scientific knowledge. This report is the first effort to bring together people with different knowledge backgrounds to address this question for lake sturgeon.

Indigenous Worldview

First Nations societies have, to varying degrees, continued to follow traditional patterns of interacting within localized environments, and therefore have accumulated detailed and specific knowledge. This knowledge, often termed traditional ecological knowledge (TEK), used in the context of this report as indigenous knowledge, can be a key factor in understanding how systems and species interact (Johnson 1992). First Nations and their perspectives can complement scientific perspectives and should be brought together in the management of systems and species such as sturgeon.

The community of Ojibwe at Sagkeeng, commonly known as Fort Alexander, have a long history of sturgeon use. The first non-Aboriginal explorers and traders of the Northwest Company (NWC) built a trade post called Bas de la Rivière in 1792. In 1804, the post was renamed Fort Alexander. The elder, Henry Letander, discussed how the creator put his people on this land many years ago,

> 'he put us here, my people. He gave us language. Told us how to live. We had no industries, no nothing. Just birch-bark canoes, that's all we had. We had tee-pees, there were no log buildings, nothing. The only place you find logs were in the Fort, that's why they called it Fort Alexander. The person, that man there his name was

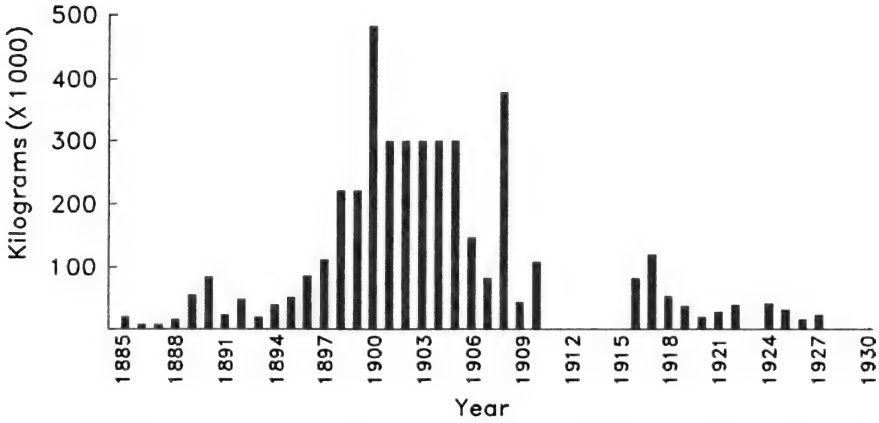

Figure 2. *Sturgeon production from Lake Winnipeg for the period (1885-1930). Sources of the data are Canadian sessional papers, Dominion Bureau of Statistics, and Department of Manitoba Natural Resoruces (C. Paci, Ph.D. Thesis)*

> Alexander, I don't know his first name, I never saw him there, it was quite a long time ago'.

That man was Sir Alexander McKenzie, bourgeois and founding partner of the NWC. The fur trade long exerted its form of commercial and political relations at Fort Alexander. For example, the Hudson's Bay Company (HBC) operated exclusively on the Winnipeg River at Fort Alexander from 1821 to 1941. Letander stated that,

> 'the Hudson's Bay Company had built a post and my people came from all over the place, all over Canada. In those days there were no boundaries, just one big country'.

The newcomers to the Winnipeg River called their trade post, and later distribution centre, Fort Alexander, and this has been the official name on maps since 1804. However, the Ojibwe had their own name, Sagkeeng. Letander noted,

> 'when the people came here along time ago, maybe 2-3000 years ago when they come out, Sagkeeng means when you come out... Sagkeeng means an open area, that's why its called Sagkeeng'.

As is typical with many Aboriginal words there are multiple meanings with Sagkeeng also meaning, *the meeting of the river with the lake*, or literally *the river shaking hands with the lake* (HBCA search file).

The Ojibwe of Sagkeeng have a long-term relationship with the Winnipeg river. Letander stated,

> 'my people use to travel'. There were no roads... their roads were the river, that's where they traveled, with the birch-bark canoe and so on, they had a trail in the forest.

As well as serving as a transportation corridor for people and goods to pass, the river acted as a source of nourishment. The river contained a variety of fish including whitefish, pike, pickerel, bass and suckers. The river corridor attracted big game-moose, deer, caribou, bear, as well as a number of smaller game and waterfowl. The great wealth of edible plants, medicinal plants, wild rice and construction materials such as birch-bark cannot be emphasized enough. Riverine systems supported rich and extensive habitat representing great bounty throughout the boreal forest-Canadian shield transition zone.

Ojibwe oral tradition conveys collective memory and group identity. Oral stories, told almost exclusively by elders, maintain the many lessons which continue to be told. The knowledge of an elder is impressive. Letander noted,

> 'as old as I get I remember more, what we used to talk about. More and more every day, like I hear them over again, talking. That's the way it is. You're going to remember this someday'.

Each member of a community will hold a piece of the overall knowledge of how a community lived as part of a landscape, on both a physical and spiritual plain. Learning for the Ojibwe is also based on observation, and Letander suggested,

> 'I would like to show you something, just to watch me. I would kill a sturgeon...I would show you all the things in there what they use'.

Like many others of his generation, Letander acquired a rich and detailed knowledge of the river,

> 'I could be talking here for hours, telling you about all the way up to Kenora. From Fort Alexander up to Kenora. I know that river like the back of my hand. I have been traveling it since I was a kid. When I was a kid we used to travel through here'.

According to Chief Robert Wavey (1993),

> 'there is a difference between traditional ecological knowledge, which is instinctive adaptation taking place within a few short years, and the body of traditional ecological knowledge which is accumulated for specific lands and handed down over many generations'.

According to Paci (1995) there are several key principals to TEK including: mutual sustainable stewardship and animate-inanimate kinship relations. TEK is characteristically oral-based, holistic, and based on intuitive, subjective experience.

A re-occurring point of discussion for Henry Letander are changes in the river.

> 'I am going to talk about sturgeon... here is Pine Falls, that's the power house, this was not built too long ago. There was a twenty something foot drop in there, that's why they built the power house. The second one is Great Falls, they built that long ago, before I was born, seventy or eighty years ago. Must be eighty, because I am seventy one right now, that was built before I was born. The next one, McArthur Falls, that was built not too long ago either, back in 1951 I think. Seven Sisters, Seven Sisters that's all Manitoba Hydro now, used to be Winnipeg Hydro, and that one there, Slave Falls'.

Figure 3. *A modified section from Captain John Franklin's map showing his route from Rainy Lake to the Saskatchewan Rivers in 1825. In: Werkentin, J. and R.I. Ruggles (eds.). 1970. Historical Atlas of Manitoa. Manitoba Historical Society, 207p.*

A comparison between the old maps (Fig. 3) and a modern map dealing with current water levels (Fig. 4) helps one appreciate how critical indigenous knowledge is to an understanding of the river. Many of the rapids, falls, and small lakes have disappeared under impounded waters. Rich feeding areas formed from natural back eddies and nursery areas are gone or considerably modified. Even the maps of the early explorers are insufficient to describe the river, since they were usually short-term residents of the

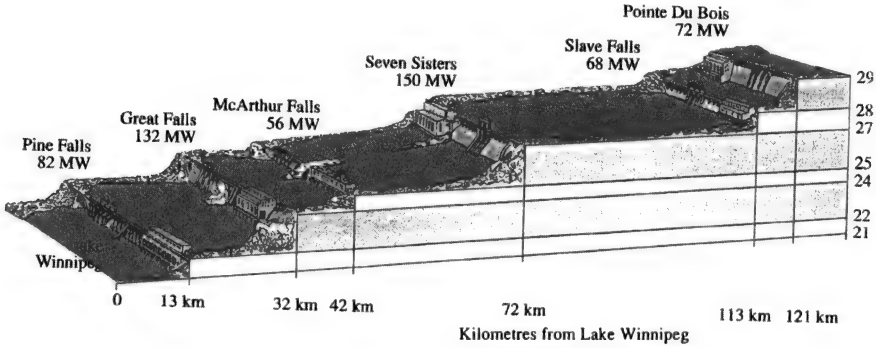

Figure 4. *Illustration of the elevation (in metres) on the Winnipeg River. Graphic courtesy of Manitoba Hydro.*

river. More important is the knowledge passed from generation-to-generation and learned from living on the river. This knowledge will be a key component of any rehabilitation program for lake sturgeon. Letander's specific knowledge is illustrated by discussing maps of the Winnipeg River,

> 'Bear River, not Spence Creek, that's Bear River, that map is drawn wrong, not the way I know the river. There are a lot of people who say they know the river, not as much as I know. I never went to school in my life, I was always on that river'.

Uses of Lake Sturgeon

Sturgeon, like other species, was used in a variety of ways. Before contact, the Ojibwe used the fish they call *namay* within subsistence fisheries. Letander stated that,

> 'they'd use the meat, they didn't use the skin, not like a moose hide, they'd tan that. They'd use that for jackets, pants, things like that. They'd use the legs of a moose, before you people came into our country, for rubbers to walk on the water. A man would take the skin off a moose leg and they would sew that up and get some stuff from the inside of a sturgeon, fat like, something like fibreglass, dry it up and you can't break it, no matter what, the water won't go through'.

The 'stuff from a sturgeon' is isinglass used as a water-proof glue. Isinglass was traded by Hudson's Bay Company and dried for use primarily in fining beer and wines.

With the coming of fur traders, sturgeon played an important role in gift exchange (Paci unpublished). As this country food became a staple of the fur trade, the fish began to take on a greater commodity value. Eventually, sturgeon became a trade commodity within a rapidly-growing commercial fishing industry, which led to the first collapse of many sturgeon stocks in North America (Cleland 1982).

Biology of Lake Sturgeon

Lake sturgeon are a long lived fish surviving up to 150 years of age, and, like sharks, have a remarkable set of structures on their snout to sense their environment. These sensory structures are important in finding food, since they feed largely by touch and smell. Letander stated,

> 'he is a very, very good fish, I'll put it that way, and very sensitive'.

An example which illustrates the sensitivity of sturgeon to their environment and indicates Ojibwe-sturgeon relations were based on reciprocity and respect for nature, was related by Letander,

> 'in the old days, in the kettle the people would boil the fish and things in there. My people wouldn't go and dip it in the river. They made sure that pail was clean before they dip that in the water. Soon as it gets that (dirt from the pot) the sturgeon heads for deep water, fast flowing water, and they stay there for three days, down at the bottom not moving, that's the way with sturgeon'.

Sturgeon are likely sensitive and also effected by industrial wastes. Letander makes an interesting observation,

'oil they don't like. I was walking in the bush where they take out trees with a machine and they drop their oil, I guess when they change their oil they just drop it there in the bush, that's pollution. In the spring time, when the snow melts the water takes the oil with it there into the creek, into the river and into the lake and the little fish will die'.

The Future

One of the great opportunities as indigenous and scientific knowledge coalesces is determining the number of lake sturgeon in a given system. Since biologists do not understand the rivers, they do not know where to look for sturgeon except on the spring spawning grounds. On the other hand, due to a long-term association with the river and fish, the fishermen have an intimate knowledge of where fish spawn and feed at different times of the year. Perhaps as stated by Letander,

'there are lots of sturgeon in that river but nobody knows where they are, they are all in the deep water, you know why, the reason sturgeon goes to deep water these days is it is full of pollution floating around'.

We need to revisit the traditional areas used by First Nations and determine if sturgeon still use these sites, or have moved due to habitat loss. Furthermore, sturgeon numbers may be too low to sustain viable populations in the traditionally fished locations. In order to answer these questions we must build on the knowledge of elders like Henry Letander and agree to a plan of action. How many young sturgeon are born each year? How many old sturgeon survive to reproduce? Is there adequate high quality habitat? How does past habitat where sturgeon were found compare to current conditions? What are the effects of pollution and dams? and, Do we undertake stocking programs to bring back the sturgeon?

Stocking cultured sturgeon is a recent move to help increase sturgeon numbers on the Winnipeg River and is seen as an addition to natural regeneration. At the moment, sturgeon are being cultured by the Department of Natural Resources and the University of Manitoba for stocking into the Winnipeg River. The elders, Henry and Laxton Letander chose the sites for stocking based on their knowledge of the river (Figs. 5 & 6). Letander stated after the first stocking in September 1996,

'I'm going to put some more fish in the water. Then hopefully, we can get a fish hatchery in a couple of years.'

Some possible biological solutions are outlined above and illustrate people working with people, at the grassroots level. However, the issues surrounding resource management are complex, involving sources of knowledge (indigenous vs. science) and several levels of governance.

Biologists need to understand that indigenous knowledge is based on a different timeline than what many western-trained scientists and researchers are used to. Funding for research is usually provided for three to five years, so plans that take longer are difficult to comprehend and implement. We definitely need a long-term plan if lake sturgeon are to be managed for many generations to come. Letander tells us,

'I like young people to understand, please, it is for your own life, and your children, and your grandchildren, and your great-grandchildren, for those youngsters yet to be

Figure 5. *Stocking of young of the year lake sturgeon in the Winnipeg River, September 1996, by elders Henry and Laxton Letander, Sagkeeng First Nation.*

Figure 6. *Henry Letander transferring young of the year lake sturgeon to the Winnipeg River at Mud Flats, September 1996. Photograph by T. Dick.*

> born. Don't just look as far as your nose, look away beyond that, beyond totality. You got the educated stick there, you're writing down, you know what's going on. If you forget you look at diary or whatever you call it. These stories I tell you are true, that's my life I am talking about'.

The integration of indigenous knowledge and science can occur at many levels and can be embodied in a variety of institutional arrangements. Community participation and management into the future is required, and First Nations communities must be able to determine their own development. Morrisseau states,

> 'Its not a matter of working within provincial or federal jurisdiction, its a matter of determining that for ourselves'.

Beyond issues of jurisdiction, we believe that First Nations, like Sagkeeng, will be directly involved in the management of lake sturgeon but much better lines of communication and support will still need to be developed by provincial and federal governments. There will have to be meaningful sharing of responsibilities.

Pinkerton (1989) found that co-management agreements have often arisen out of crises. Most of the lake sturgeon populations are definitely in crises, since most fisheries have been closed for conservation reasons. Co-management successes have been limited to date. The process involves people, communication and the resource. In this process, the elders' knowledge and communication skills are a key component along with good scientific knowledge. Berkes (1994) stated that 'real co-management involves shared decision-making power by the partners and requires governments to devolve some of their power to the partners; but in practice there is a wide variety of partnership arrangements that involve various degrees of power-sharing'. Morrisseau believes,

> 'we have to work towards some of these things, its not a matter of following contact signs, looking for answers there, it's not a matter of going back to a romantic notion of what traditional life was about, but it's about bringing the traditional ecological knowledge into a very useful and practical manner. It's how can we use both and together go from there'.

We believe that the management of the sturgeon will be greatly enhanced with extensive involvement of community elders and fishermen and that participation by local communities will be a key factor in long term improvements in sturgeon management.

Acknowledgements

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The Politics of Marine Mammal Management: International Regulation of Inuit Whaling

Mats Ris[1]

Since the late 1980s a key concept in international environmental policy has been sustainable development. This idea prescribes general principles for the utilization of living natural resources and maintenance of biological diversity. In spite of these generally accepted ambitions, cultural conflicts continue to plague many natural resource management issues. One such example is the international regulation of whaling.

Since 1972, Inuit whaling has been of special interest to the International Whaling Commission (IWC) because some whale species hunted by Inuit were reported to be endangered. Developing and implementing management policies within the IWC is influenced by Western attitudes towards Inuit culture and the nature of subsistence hunting, such as warnings of unsustainable whaling following the introduction of "cash income" in Inuit communities. This paper provides a brief presentation of the management relationship between Inuit whaling and the International Whaling Commission (with special emphasis on the Alaska Iñupiat case) and some thoughts on the cultural complications that are embedded in their relationship.

Historical Outline

The history of European and North American hunting of baleen whales provides us with one of the more extreme examples of mismanagement. Numerous and uncontrolled whaling expeditions brought the bowhead, right, and gray whales to the brink of extinction.

The commercial bowhead whale hunt in the Eastern Arctic began in the 17th century with occasional expeditions to Davis Strait, followed by regular intensive hunts in 1719. At this time, British, French, German, and most important, Dutch whaling fleets, had cruised the waters around Jan Mayen and Spitsbergen for over a hundred years. Spitsbergen was a centre for the industry, employing thousands of whalers and

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craftsmen at the shore-stations established by the Dutch. With the decline of the Spitsbergen whale fishery, whaling operations moved further west. During 1720-1740, more than 100 Dutch ships operated in Davis Strait. British, German, and Danish fleets followed, encouraged both by the rich hunting grounds and trade with Greenlanders (Hacquebord 1990).

In 1817, British whalers managed to cross the icy waters of northern Baffin Bay into the open waters on the western side, where they found new whaling grounds. The establishment of whaling stations on Baffin Island brought Europeans and Americans in contact with Inuit. In the mid-19th century, American whalers began to show interest in the Eastern Arctic, and in 1860, New England whalers started a period of successful whaling in Hudson Bay. During the following decades, whaling became the most important mechanism for cultural change in the region (Francis 1984, Ross 1975).

The rush for commercial whaling in the Western Arctic started in 1848, when Thomas Welcome Roys sailed through the Bering Strait searching for bowhead whales. The year after, following the declining sperm whale fisheries, over 150 ships went north, revitalizing the whole whaling industry. In the decades to follow, over 2,700 expeditions took place, which greatly reduced the bowhead population (Bockstoce 1986, Ellis 1992).

The last frontier of Arctic whaling began in the 1890s, when American whalers penetrated the Beaufort Sea. The basis for this daring enterprise was the invention of steam engines and the help and knowledge of local Inuit. The contact between whalers and Inuit sometimes resulted in severe consequences for the latter and can be said to have opened up the Canadian Arctic for colonization by entrepreneurs, missionaries, and administrators (Francis 1984). Logbooks and other historical records indicate that one-third of the total known number of whales killed (18,600) occurred in the first six years and two-thirds in the first twenty years (Bockstoce and Botkin 1983), thus indicating the efficiency of the fisheries.

After the commercial fisheries collapsed in 1914, the Iñupiat of Alaska caught about 10-12 bowhead whales annually until the end of the 1960s. From the early 1970s, catches in Alaska increased to an annual average of about 30. This was the starting-point of the concerns raised by the IWC over the status of the bowhead whale and Inuit whaling.

Today, the primary species taken by Inuit are gray whales off Chukotka (Krupnik 1983, Marquette and Braham 1982), bowhead whales (Freeman 1992, Worl 1980) and beluga whales (Hunt 1979, Lowry 1989) in the Beaufort Sea, beluga whales and narwhals in the Canadian Eastern Arctic (Kemper 1980) and Greenland (Heide-Jørgensen 1990), and minke whales (Caulfield 1991, Josefsen 1990, Larsen and Hansen 1990) also in Greenland.

Early Management of Aboriginal Whaling

The International Whaling Commission is the offspring of the International Convention for the Regulation of Whaling (ICRW), signed in Washington, 2 December 1946. The Convention consists of a number of basic regulations, which are subject at any time to amendments of a Schedule, *i.e.*, a set of instructions for the practical conduct of whaling and other related matters.

The Commission has three Committees that offer advice to the Commission itself: the Finance and Administration Committee, the Scientific Committee, and the Technical Committee. The Scientific Committee reviews biological and statistical data and

makes recommendations to the Commission on research, quotas, and status of whale stocks. The Technical Committee discusses issues raised by its various sub-committees and working groups, and forwards its conclusions to the Commission as recommendations for action. Decisions taken by the Commission may result in Schedule amendments, which require a two-thirds majority to pass. These changes become effective and binding for contracting members, unless a member government files an objection on its behalf within 90 days. The Technical Committee in turn has two standing sub-committees: Infractions and Aboriginal Subsistence Whaling. A number of *ad hoc* working groups also review relevant information, such as socioeconomic considerations of the present moratorium, humane killing aspects, and various forms of small-type whaling.

The 1946 Convention, as well as the 1931 international whaling agreement that preceded it, was concerned with the problems of regulating large-scale industrial whaling. The 1931 treaty did not apply to Aboriginal whalers hunting species of interest to commercial whalers, under the following circumstances: 1. They only use canoes, *pirogues* or other exclusively native craft propelled by oars or sails. 2. They do not carry firearms. 3. They are not in the employment of persons other than aborigines. 4. They are not under contract to deliver the products of their whaling to any third person.

The general idea behind these conditions was obviously to ensure that the main purpose of the treaty, namely, to safeguard the commercial interests of the whaling industry, was not undermined. It is noteworthy that the two major "dangers" are thought to be the introduction of new technology (boats, firearms) and cash economy (employment, contracts).

The International Agreement for the Regulation of Whaling of 1937 made no reference to Aboriginal whaling, but included instead a general prohibition of taking "right whales" (i.e., including bowhead whales). However, the first Schedule (adopted in 1950) of the 1946 Convention combined the two expressions by stating, that "it is forbidden to take or kill gray whales or right whales, except when the meat and products of such whales are to be used exclusively for local consumption by the aborigines" (Gambell 1993: 101).

From the beginning, it seems that the reason to include Aboriginal whaling in international agreements is that it is *de facto* a form of whaling, but regarded differently from industrial whaling operations, and not seen as being important if operated as a strictly local-level activity without any links to international trade. In the early 1970s, this situation changed from being a case of exemption to becoming a matter of conservation. In 1970, the United States introduced its *Marine Mammal Protection Act* (MMPA), and in 1972, the *United Nations Conference on Human Environment* (UNCHE) proposed a worldwide moratorium on all commercial whaling. In 1975, the IWC implemented its *New Management Procedure* (NMP), thus automatically offering full protection for some commercial whale stocks.

The Alaska Controversy

In the backwater of IWC's work with the NMP, Aboriginal whaling did not escape the vigilance of the Commission. Already in 1972, the Scientific Committee raised concerns over the status of the Bering/Chukchi/Beaufort stocks of bowhead whales. In 1977, it reported that the original size (11,700 to 18,000) of the stocks from the time before 1848 had been reduced to a number between 600 and 2,000 (IWC 1978). The Commission was also worried over changes in Iñupiat whaling techniques. The number

of whaling crews and catches began to rise significantly compared to previous years. From an average of 11 whales landed annually in the late 1960s, the number rose to 29 in 1977, and most strikingly for the IWC, the number of whales struck and lost increased, especially in the 1977 season (Marquette 1979).

The bowhead whales were on the IWC agenda every year between 1972 and 1977, and during this time the Commission repeatedly requested better information from the United States government. In 1977, the IWC abolished the exemption for "aboriginal subsistence whaling" from the Schedule. The existing ban on hunting right whales now implied a zero catch quota for the Alaska Iñupiat. The IWC believed that the bowhead whale was the most endangered of all species and that it could fall below a critical size which could not be sustained in case of natural environmental fluctuations (Gambell 1993).

After the 1977 meeting of the IWC, the United States held numerous public hearings and a *Final Environmental Impact Statement* (FEIS) was prepared. It considered the importance of bowhead whales for the Iñupiat and the United States foreign policy in other conservation areas. Only four days before the 90 day expiry date, the government announced that no objection would be filed. After Iñupiat in turn filed suit against the United States Foreign Secretary, the Court supported the Government's political aspirations (Bliss 1979) rather than defending the subsistence economy of their own Aboriginal Peoples. The worries of the outside world at the time were expressed by the secretary of the IWC:

> Clearly this was a drastic measure, but the evidence presented by the scientists indicated that there was a real risk that the expanded slaughter of the bowhead whales...would lead to the extinction of the stock within the foreseeable future. Allowing such a possibility was quite contrary to the Commission's conservation policy and clearly it had to act in what it saw to be a desperate situation [Gambell 1982: 2].

This was the starting-point for the "Bowhead Battle" (Bockstoce 1980). United States authorities and Iñupiat of Alaska responded immediately. The whaling villages in Alaska set up their own organization, *Alaska Eskimo Whaling Commission* (AEWC), to deal with the IWC problem and promote research and better information about the issue. By legal proceedings and lobbying, the Iñupiat persuaded the United States government to press for limited whaling at the IWC special meeting in December 1977. The Commission then accepted a catch of 12 landed or 18 struck whales for the 1978 season, together with a scientific programme and regulatory measures of the hunt (IWC 1979a). At the IWC annual meeting in 1978, the results of the American research programme showed that the estimated size of the Bering/Chukchi/Beaufort bowhead stock was 2,260 (IWC 1979b) and the Commission, in spite of warnings from the Scientific Committee, set a quota of 20 landed or 27 struck whales for 1979 (IWC 1979c). Since the late 1970s, methods in bowhead whale research have improved, and the latest abundance estimates for the Bering/Chukchi/Beaufort stock is set to 8,300 (95% confidence interval 6,200 to 13,700), with an annual replacement yield of around 250 individuals (or an annual net rate of increase of 3.1%) (IWC 1992). The most recent four-year catch quota for Alaska Iñupiat is set to 204 landed, and a maximum of 266 struck, bowhead whales for the years 1995-1998 (IWC 1995). The latest figures are for

a five year (1998-2002) catch limit of 280 bowheads landed, with no more than 67 strikes occurring in any single year.

Recent Management Principles for Aboriginal Whaling

To shed light on IWC's problem with Aboriginal whaling and to find new management approaches to satisfy all involved parties, the Commission arranged a special workshop in Seattle in February 1979, consisting of three panels of scientific experts: wildlife, nutrition, and cultural anthropology. The wildlife panel emphasized, that from a biological point of view, no Bering/Chukchi/Beaufort bowhead whales should be hunted at all. The nutrition panel concluded that bowhead whales do not provide any food material which cannot be obtained from other sea mammals, so that the bowhead is not uniquely required in the diet. The cultural anthropology panel reviewed various sociocultural aspects of the bowhead whale in Iñupiat society. It noted the importance of cultural preference in choosing food, and that cultures by nature are dynamic and changing in response to prevailing conditions, but the way in which the changes are introduced affects the final outcome: natural changes in the environment produce very different reactions than changes imposed from outside (IWC 1982).

In the following years, the IWC continued the work toward its management principles for "Aboriginal subsistence" whaling. In 1980, the Commission took the important step of establishing a Technical Committee working group, which met in 1981 for the first time. Among the issues were the following definitions agreed by that group:

> Aboriginal subsistence whaling means whaling, for purposes of local Aboriginal consumption carried out by or on behalf of Aboriginal, Indigenous or Native peoples who share strong community, familial, social and cultural ties related to a continuing traditional dependence on whaling and on the use of whales.
>
> Local Aboriginal consumption means the traditional uses of whale products by local Aboriginal, Indigenous or Native communities in meeting their nutritional, subsistence and cultural requirements. The term includes trade in items which are by-products of subsistence catches.
>
> Subsistence catches are catches of whales by Aboriginal subsistence whaling operations.

The working group emphasized strongly, that "full participation and cooperation of the affected Indigenous Peoples are essential for effective whale management" and the advantage of "involving Indigenous peoples in the decision-making procedures of the IWC, thereby enabling them to see at first hand how and why decisions are taken" (IWC 1981: 3-4). The group also found, that "the traditional hunt plays an important role in maintaining the spiritual and social structure of the community", even if whaling in some areas is only a minor part of the total hunting and fishing activities (IWC 1981: 8).

The issue that caught most of the attention (and debate) among the members of the working group was the overall management objectives for Aboriginal whaling. Some members of the group expressed the view that every whaling culture has its own history and tradition, and that there is no reason to take discriminatory approaches between subsistence and commercial whaling. Since both forms of whaling were argued to imply the same interaction between humans and whales, the same management principles

should be applied. Other members of the group argued that there are substantial differences between the two forms of whaling regarding "the need for whale products for direct subsistence use in a traditional cultural context". It was argued that for commercial whaling there is a much less direct dependence on whale products in the maintenance of the culture and that sale of products is the primary reason for continued catches; subsistence whaling is undertaken to meet "immediate nutritional requirements and satisfy important cultural needs" (IWC 1981: 9-10).

The group noted that it was necessary to develop objectives that could be "applied to Aboriginal subsistence whaling to avoid continued *ad hoc* consideration of subsistence catches and to provide a framework for the Commission". The working group agreed on the following objectives:

> To ensure that the risks of extinction to individual stocks are not seriously increased by subsistence whaling.
>
> To enable Aboriginal people to harvest whales in perpetuity at levels appropriate to their cultural and nutritional requirements, subject to the other objectives.
>
> To maintain the status of whale stocks at or above the level giving the highest net recruitment and to ensure that stocks below that level are moved towards it, so far as the environment permits.

At the 1982 meeting of the IWC, the Commission accepted this report and adopted a resolution on its objectives. It also decided to establish a standing Technical Committee (sub-committee) to review future documentation. Finally, the Commission adopted a proposal on management for Aboriginal whaling to be amended to the Schedule. The conditions for annual catch quotas were established in accordance with the scientific and technical principles of *Maximum Sustainable Yield* (MSY), as developed under the New Management Procedure for other forms of whaling (IWC 1983).

The management principle adopted for Aboriginal whaling was that species conservation should come before the needs of affected communities. Still recognizing the "cultural and nutritional needs" of Aboriginal peoples to continue the hunt, scientific considerations were ranked first. Mitchell and Reeves stated: "under no circumstances should the cultural survival of a human community be placed ahead of the biological survival of a species" (1980: 714). After the deletion of the exemption clause in 1977, Aboriginal whaling was now fully incorporated into the management strategy of the IWC.

From Exemption to International Control

The review of international regulation of Aboriginal whaling over the last 60 years indicates that whaling has developed from exemption and independence to international regulation and domination. Important structural changes occurred in recent environmental strategies in the outside world. When Iñupiat catches began to rise in the early 1970s, it was not a particularly dramatic event. Changes occur frequently in all subsistence hunting and fishing economies, either depending upon changing environmental, political, or external economic factors. Consequently, hunting communities are constantly solving problems and adapting to new situations. But in light of the new management policy of the IWC, any increase of any hunt was relevant, even if it was

only a matter of another 15-20 whales per year. For the first time since whaling became a matter of international regulation, the IWC was now developing a strong management regime for commercial whaling based on scientific arguments. Furthermore, the proposal from the Stockholm conference in 1972 of a worldwide moratorium on commercial whaling began to take form. In this general atmosphere of conservation, the membership of the IWC changed, and the small number of whaling nations were soon out-numbered by voting members opposed to the killing of whales. In other words, the main reason behind the Alaska controversy was not so much to be found in the sudden change of Iñupiat whaling, but rather in the structural changes of the IWC (and to a certain extent United States foreign policy).

Would the exemption clause in the IWC Schedule still be in force if Aboriginal catches today were of the same size as in the late 1960s? The answer is probably "no". It would eventually be deleted in favour of a more firm and direct control mechanism due to the structural changes of the IWC.

Direct IWC regulation of Aboriginal whaling may not, of course, be necessarily bad for Inuit whalers as long as the IWC offers them a reasonable quota. International management regimes can be useful for the regulation of, and cooperation on sustainable use of migratory, regional wildlife resources, such as bowhead whales. In the case of Aboriginal whaling, however, the future problem with an international, global management regime, such as the IWC, may not lie so much in its scientific or administrative language, as it does in its implicit language, expressing preconceived notions about Aboriginal Peoples and hunting.

The *ad hoc* Technical Committee working group in 1981 reveals many of these preconceived notions about Aboriginal Peoples. One such notion is *domination.* The IWC has implicitly indicated in its reports and documents their hierarchical position towards Aboriginal People. The wish for "involving Indigenous Peoples in the decision-making procedures" is argued to be essential for effective whale management, since it enables Aboriginal Peoples "to see at first hand how and why decisions are taken". It seems that "participation and cooperation" are useful to the IWC as long as the Inuit are recipients and accept a subordinated role vis-à-vis the IWC. Inuit representatives are never allowed to freely address the various working groups, sub-committees, or the Commission itself as equal partners in the "decision-making" process. The IWC does not recognize Aboriginal Peoples as "first hand" members, since membership is only open for contracting governments. It is therefore impossible for Aboriginal Peoples to file any objection directly to the Commission.

Another important notion is *subsistence.* The definition provided by the IWC working group in 1981 explicitly connects "subsistence whaling" with "Aboriginals" and on the condition that it is limited for "local consumption" and meeting "nutritional and cultural requirements" among people "who share strong community, familial, social and cultural ties" related to traditional dependence on whaling. It is noteworthy that the IWC has avoided defining words like "Aboriginal", "subsistence", and "commercial" and therefore they remain ambiguous. By emphasizing the word "Aboriginal", the Commission obviously seeks to exclude other groups from the use of such a crucial analytical concept as subsistence.

The purpose seems to be to create a sharp borderline between Inuit whaling and other forms of whaling, such as Japanese and Norwegian small-scale, family- and community-based whaling. In a comparative perspective, recent anthropological studies (Akimichi 1988, ISG 1992, Moeran 1992) have shown that small and isolated

whaling communities in Japan, Norway, and Iceland also share strong social and cultural ties to whaling. Community-based whaling in Greenland and Norway shows many similarities in social organization of the hunt, distribution of the whale meat, hunting methods, and means of production (Caulfield 1991, ISG 1992). Yet, the IWC manages Greenlandic whaling as Aboriginal subsistence whaling (whaling "for subsistence need") and Norwegian whaling as commercial whaling (whaling "for profit"), regardless of the relevance of these concepts to the management of the whale stocks in question.

Accepting only two management categories of whaling, and developing a management regime specifically for Aboriginal whaling, produces a regime that can be a powerful political instrument against other forms of whaling. Several members of the Commission have expressed their sincere support and understanding for the importance of whales for maintaining the social structure and Inuit way of life, and incorporated these considerations into the management regime. The IWC has denied other whalers the same management considerations, despite the many similarities between the various forms of community-based whaling.

The best example of this political polarization is the Japanese request for a very limited interim relief allocation, due not only to economic, but also social and cultural hardships caused by the present worldwide moratorium on commercial whaling. Japan has for the past ten years submitted a considerable amount of documentation to the IWC on the importance of whales for the communities concerned (ICR 1996). This, to convince the Commission that Japanese coastal whaling consists of *both* market-oriented sales *and* important religious, social, and cultural obligations. Similarly, the Commission has repeatedly expressed their sympathy to Aboriginal communities, and an understanding for the hardships that Japanese whaling communities suffer, but nonetheless denied them a modest quota to maintain the social and communal networks. The simple explanation given is that there is a moratorium on commercial whaling and that Japanese small-type coastal whaling is considered by the Commission a form of commercial whaling.

Concluding Remarks

The current management regime for Aboriginal whaling, as created by the International Whaling Commission, runs the risk of failing whenever the Commission has to deal with it in the future. It will fail because the decision-makers of the Commission have incorporated their own preconceived notions about Aboriginal Peoples in the management objectives, and furthermore used these notions as a political instrument against other whaling communities.

This has been clearly demonstrated in recent years by the requests from Aboriginal communities trying to resume old whaling traditions. In 1996, Makah Indians from Washington state asked the IWC for a quota of five (non-endangered and abundant) gray whales, resulting in the proposal being withdrawn at a late stage by the United States government after an obvious lack of support for amending it to the Schedule. And in the same year, the IWC failed to grant Siberian Yupik in Russia a quota of five bowhead whales from the Bering/Chukchi/Beaufort stock. The quota was requested as an attempt to relieve the serious situation facing local people following the collapse of the regional economy and serious food shortages in the Siberian north. Although both these proposals were subsequently approved (in 1997), some IWC members continue to oppose aspects of the agreements.

If the IWC wishes to effect better management of "Aboriginal subsistence whaling", it must improve its working relationship with Inuit organizations. Such an approach within the IWC will allow the possibility of improved understanding of the nature of subsistence whaling and related issues. The prospects of such a development appear, regrettably, very distant today.

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Inuit Bowhead Whaling: Canadian Inuvialuit Response to History, Tradition, and Modern Management

Mats Ris[1]

Whaling is managed internationally (Holt 1985, Nafziger 1980, Nielsen 1986), while high-seas fisheries are managed regionally or nationally. In spite of recent attempts to reduce the regulation of whaling to a more appropriate regional level, as for example the case of the North American Marine Mammal Commission (Hoel 1993), the impetus behind management initiatives is still based on hard science and political motives (Fløistad 1989, Sahrhage 1989).

The following study is an example of a management regime created from historical and cultural, rather than political or scientific necessity. On the 3rd of September 1991, Inuvialuit hunters from Aklavik, Northwest Territories, successfully caught a bowhead whale off the Yukon coast. The hunt was a longed-for culmination of a cultural, political, and legal process over a period of 25 years and constituted the first hunt of its kind in over 70 years.

The hunt was followed by celebrations in the Inuvialuit community. The celebrations were an expression of the hunt and a collective manifestation of several other aspects of Inuvialuit history and contemporary society. The celebrations embodied aspects and meanings in mainly three areas. First, the historical significance of the hunt includes many decades of social and economic hardship for the Inuvialuit due to the influence of non-Inuit people in the region. Second, in spite of the fact that no bowhead whaling had taken place for three generations, the cultural relationship with the whales had been maintained during times of hardship. Third, for the past ten years the legal and constitutional framework had been strengthened through the patient development of a land claims agreement, and proper management initiatives, which culminated the eventual issuing of a formal hunting license. Finally, it is also notable that recent biological research offered valuable insights to the stock size, reproduction, and migration of bowhead whales that proved their healthy status.

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Historical Significance of Whaling

Before the arrival of non-Inuit colonizers, the Inuit of this region constituted five groups (Usher 1971), each with its own territory, known collectively as the *Chiglit* (Petitot 1981). Their subsistence economy was based on a variety of activities, including fishing, sealing, whaling, and caribou hunting. The nearness to trees and access to considerable amounts of driftwood made construction of large dwellings possible: houses were large, permanent, covered with earth for insulation, and often hosted several families. The rich lands and waters supported a large Chiglit population of 2000 to 3000 in the mid-19th century. In the summer, beluga whale camps of the Kittigazuit, included a thousand people, the largest Inuit community in Canada (McMillan 1988).

Beluga whaling was the most important hunting activity. Beluga whales congregate every summer for a few weeks in large numbers in the Mackenzie River estuary. For centuries, they offered people an excellent food resource. The original hunt, as it was practised until the end of the 19th century, was a large and organized event, especially at Kittigazuit where whales were trapped by a well-organized hunting team (McGhee 1974). Other local groups were also involved in bowhead whaling to a lesser degree. The hunters at Cape Bathurst caught one or two bowhead whales annually by using *umiaks* or kayaks in the open sea (McGhee 1974).

For the Chiglit, the second half of the 19th century was a period of dramatic change. Frequent contacts with non-Inuit traders created new economic and social relationships. During the 1850s they began trading fur for European goods at an increasing rate. By the 1860s, contacts between non-Inuit and Chiglit changed when the first American whalers arrived in the Beaufort Sea (McGhee 1974). During the following decades Chiglit were plagued by epidemic diseases brought in by the whalers. By the late 1880s, the population and social structure was eroded. By 1910 measles epidemics had reduced the population to about 130 persons (Usher 1971).

American whaling in the Western Arctic started in 1848 and in the decades to follow, over 2,700 expeditions took place (Bockstoce 1986). The last frontier of Arctic whaling began in the 1890s, when American whalers penetrated the Beaufort Sea (Francis 1984).

The centre of whaling and trade activities at this time was Herschel Island on the Yukon coast, which, during the long winters, could host several hundreds of whalers and Inuit hunters and workhands. Many *Iñupiat* families in Alaska were brought into a trade economy based on providing services for the whaling industry, especially supplying meat and fur to support the wintering whalers. These trade relations brought socioeconomic changes to the Inuit and created a strong element of economic and technological dependence. Around 1910 the whaling industry rapidly came to an end. Iñupiat families involved in whaling and trapping shifted to primarily trapping to maintain access to trade goods. As the Chiglit population decreased, Iñupiat families migrated to better hunting and trapping grounds at the Yukon coast and the Mackenzie Delta. Herschel Island became a fur trade centre until fur traders moved on and Inuit once again migrated eastward to maintain their trapping economy (Usher 1971).

In the mid-1920s, 75 per cent of the people in the MacKenzie Delta were of Alaskan origin, now referring to themselves as *Inuvialuit*. The fur trade boomed and the town of Aklavik became the new fur trade centre. In the mid-1930s, fur prices dropped and a depression struck the whole region. Inuvialuit went through another economic crisis, until the second world war brought temporary prosperity to the region (Usher 1971).

In the following decades, other aspects of non-Inuit development seriously affected the Inuvialuit. The missionary schools and hospitals offered health care and education

at the expense of disrupted family relations. Children were often removed from their families for long periods, weakening both language and cultural values (Honigmann and Honigmann 1970).

The Inuvialuit also faced the hardships of relocation plans in the 1950s. In 1955, the new town of Inuvik was built in the Delta (40 miles east of Aklavik) as a response to increasing government activities in the region, including the plans for a total abandonment of Aklavik and relocation of people and their activities into the new settlement. Inuvik may have been a suitable place for government activities, but it was not a better place for many Inuvialuit, who now experienced the discomfort of having to move away from relatively secure hunting and trapping grounds. The original plans to abandon Aklavik were never implemented, though many Inuvialuit chose to move. The establishment of the new town meant the number of non-Inuit administrators, entrepreneurs and militaries increased dramatically and brought in a stronger element of wage labour economy (Honigmann and Honigmann 1970).

With the discovery of oil on the Alaska North Slope in the late 1960s, extensive prospecting activities took place in the Mackenzie Delta and coast for other oil resources. Exploration had serious effects on wildlife and created a sense of loss of control over village life (Berger 1988).

Cultural Significance

Inuit all along the Beaufort Sea have always had in common their cultural affinity with bowhead whales. The history of this region not only shows a long series of events where the Inuvialuit have struggled out of one hardship into another, but it also explains why the Inuvialuit had difficulty maintaining the hunt for many decades. A successful hunt requires knowledge, skills, proper equipment, and organization. In times of hardship, the latter are especially hard to achieve.

The knowledge and memories of the hunt, and notably the highly regarded taste of bowhead *muktuk* were kept alive by Alaskan hunting communities. This tradition developed into an "unfulfilled cultural need" and a strong wish to see the bowhead hunt resumed (Freeman 1992).

In spite of the rapid social and economic change throughout the Arctic, Inuit everywhere continue to hold hunting as the highest of human achievements, to the extent that it constitutes the main expression of cultural values and identity. Freeman (1992) points out that hunting remains of considerable importance, even among those Inuvialuit who base their family economy on wage employment. Inuit maintain a strong connection to the land, cultural values, and the production, distribution, and consumption of traditional country food. The special pride Inuvialuit feel about bowhead whaling has been aptly expressed by the whaling captain's wife of the 1991 hunt:

> My husband has never been to school to learn to read and write. But he has hunted all the animals over the years. He is a man. Now he has hunted the bowhead; he is a real man! (Freeman 1992: 40)

Inuvialuit hold the bowhead whale in extraordinary esteem. The hunt has become an important means for expressing the hardships of the past Inuvialuit identity, and their distinctive culture. As part of emphasizing their cultural identity, the Inuvialuit have also tried to revitalize the Inuvialuktun language and traditional performing arts in local schools.

Juridical Significance

The first steps to resume the hunt were taken in the 1960s through a number of reports and council meetings in the Northwest Territories. In 1965 hunting licenses were issued for three Inuvialuit communities. In 1976, another approach was made by Inuit organizations on both the regional and national level to raise the issue. This attempt was interrupted by the 1977 decision of the *International Whaling Commission* (IWC) to set a zero quota on Alaska Iñupiat bowhead whaling. Since Canada was a member of the IWC and the Inuvialuit emphasized their inherent right to the hunt, the bowhead whaling issue turned into a political conflict between Inuvialuit and federal authorities (Freeman 1992). Since the mid-1970s, Inuvialuit were involved in extensive land claim negotiations with the federal government, which in part could offer a solution to the issue.

On behalf of the Inuvialuit, the *Committee for Original Peoples Entitlement* (COPE) signed the *Inuvialuit Final Agreement* (IFA) with the Government of Canada in 1984. The agreement covers a comprehensive range of issues in the *Inuvialuit Settlement Region* (ISR) including land, wildlife, financial compensation, eligibility, corporate structures, and economic matters. It was passed by the Canadian Parliament as a constitutionally-protected federal law under the *Western Arctic (Inuvialuit) Claims Settlement Act* on 16 June 1984. Under this agreement, the Inuvialuit receive specific rights and benefits, including title to land, cash compensation ($45 million as of 1977), economic development measures, wildlife harvesting and management, and participation on advisory boards dealing with land use planning and environmental management (Frideres 1993, Keeping 1989).

Concerning bowhead whaling, the IFA declares that "the Inuvialuit shall have first priority for the harvest of marine mammals... and the right to harvest a subsistence quota to be set jointly by the Inuvialuit and the Government" (IFA 1984: 26). The decision-making structure under the IFA has three management levels. On the Inuvialuit side, each of the six communities in the ISR is represented by a *Hunters and Trappers Committee* (HTC), which together form the *Inuvialuit Game Council* (IGC). On the government side the appropriate ministerial department (in the case of fisheries, the Department of Fisheries and Oceans) represents the Canadian state. In order to promote effective co-operation between the two parties, a number of joint management bodies were established by the IFA, among them for example, the *Fisheries Joint Management Committee* (FJMC), which assists the other parties by reviewing information on the state of fisheries, maintains registration for and regulates fisheries and allocates subsistence quotas (Bailey 1995).

As an example of this structure, the Aklavik HTC presented in a proposal to the IGC in August 1988 a request for the hunting of one bowhead whale. Emphasizing historical, cultural, scientific, and other aspects of the hunt, the IGC endorsed it and forwarded it to the FJMC, which reviewed and supported it, and in December the same year sent the proposal to the Minister of Fisheries and Oceans for approval. The Minister in turn, being bound by the IFA, supported it since it fulfilled the conditions in the agreement. On 22 August 1991, officers from the Department of Fisheries and Oceans issued the license to Aklavik HTC at a signing event on location at a hunting camp on the Yukon coast and 12 days later the actual hunt took place (Freeman 1992).

Concluding Remarks

For many Indigenous resource users, common words such as "management" and "wildlife" are often filled with cultural ambiguity and discomfort, especially when applied to cases seen as irrelevant by local communities. Such words themselves are anchored in Western political thought and established science and only to a limited extent are applied to the local, social, and cultural needs of the peoples most concerned with and affected by state management decisions. The importance of using renewable resources goes beyond the pure economic value of the resource products. In the Inuvialuit Settlement region, as well as in other local communities engaged in subsistence activities, resource use and related management issues are increasingly being considered by outside interests in terms of maintaining the local social fabric and lifestyles of the north. In this respect, the Inuvialuit case is a good example of the progress that can be made in resource management when political authorities respect local tradition and the trust these authorities gain from local communities in return.

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